Heterocyclic Chemistry
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Lecture - 9
Effects of Ring Nitrogen-C

I think the topic says again effects of nitrogen, special effects specialty reactions due to the presence of nitrogen. When I say nitrogen, it is synonymous with other heterocycles, but our reference is nitrogen in heterocyclic chemistry.

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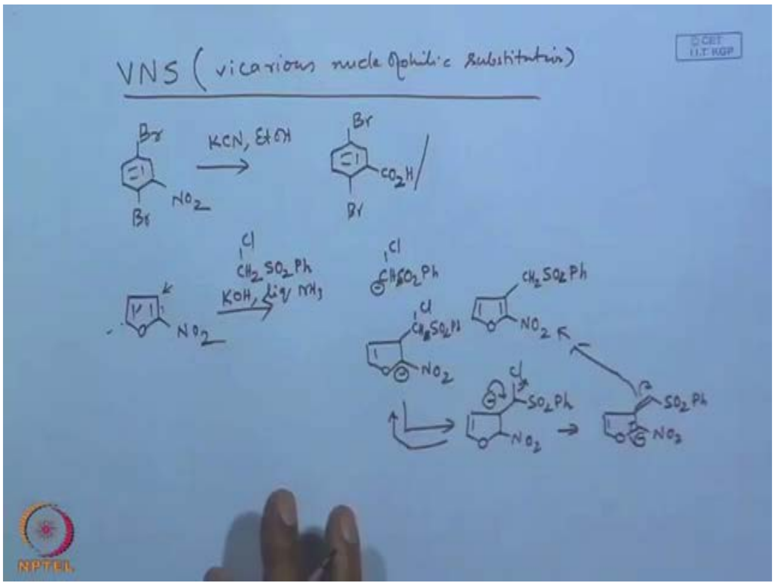

And today we take up this special topic, that is VNS, see I told you before that is, Vicarious Nucleophilic Substitution. Many of you have actually read this type of reactions, but it has never be categorized as Vicarious nuclear substitution reactions. Like many of, you know this sanger's agent, sanger's reagent is 2 4 di nitro fluoro, what happens I mean, if you just add a nitrogen electrophile if fluorine get substituted. That means, is in ipso substitutions, replace where at...

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I mean, if so and the sense that, the position where the ring should be occupied, that is being substituted, that is a typical one, them is if you have a substituted orthopara to the hydrogen then that nicely substituted. But, then I if you say go to let us what happens, if you have a similar reaction like bromine and bromine here and then again an nitro, nitro is present, nitro and then is a very simple agent is commonly available to agent what is potassium cyanide and ethanol and what you get is as reflex it you get is something un usual.

So, hypothetically rather in analyze with sangajski agent one and expect that cyanide goes replace the bromine, because that is orthogonal nitrogen and the other bromine is matured to the nitrogen. So in fact, many most many people have said outside Bengal do not know actually sorry I actually should not record this any case we have to edit it, I think I should at one point will edit it at any case. So, what is the product then the product is a nice product actually you often forget.

So, it is this or we can say actually or just a reverse it basically that means, carboxylic acidic getting introduced into the nitro, Krishna did you know, thus this reaction before yesterday I thought any case; so this is the kind of reaction for a week area substitute solution well unusual that is it. So, but it is no heterocyclic here, so if you look we will have more examples actually, in the another class we have only examples and examples an week area substitute solution.

What you will see let us look at a reaction this is actually, developed by fully substitute scientists what he does he takes a nitro substituted compounds be it in a hermetic be it in simple hetero cycle. In this case nitro fern. What one would expect out of nitro fern basically, some electrically substitution equally substitution reactions traditional once, but if you have a leave nucleophile like it is solve full expressively surf one carrying and living group, carrying a living group.

That is minimum requirement or there is one of the substitution behaving the nitro group, the other would be having a nucleophile having a living together it, there must nucleophilic atom must carry the living group that means. In this case which one is living group in the presence of base in this case the base is a K O H and solvent is liquid ammonia. So, all of us know under the condition this C H C H would form this anion here this is 2 some anion here then you have a chlorine I do all of us know if this sulphide is, so active never the hydrogen is activated from the carbonized.

So, sulphate substitute carbonized, so obviously, it look for in an electricphilic centre and in the nitro is freon in this case this all you have I been, so many if you just look at the resonance and this 1, 2 and 3 position is electrophilic then if you further de-localized the double bond the number 5 also be nucleophilic, but in this particular example the reaction has taken place from this see position. So, and the product here I think here you can make out the product should be the product in this case is a very nice reaction.

So, after substituted nitro compound and between this 2 groups sulphone and chlorine is explained. So, I think I do not have to write the mechanism and do I have to basically additional elimination taking place at a never implies. There means the intermediate would look like a carbonate here then CH 2 SO 2 PH sorry CH and then C l, what next in this case m one can quickly that the probably the reaction also in equilibrium is having a anion are here the anion is shifted then you have to have a SO 2 PH, so this is a this is basically a equilibrium.

So, in some point will have some amount to anion here at the never income, so then one can quickly see that elimination taking place and obviously, the counter anion of the stronger acid would be between the sulphonic acid and S C L is more acidic corresponding group is more better living group. So, as a result, so what you will find, so at one point this are all should be should be in the bracket it and of course, the final step would be this herbertization, so that means, final step this will form anion here and this hydro cyclic herbertization is diving force, so eventually it will go to that and diving work up you will get this.

So, like this there are plenty of examples plenty of example standard protocol, now if you have a nitro substituted compounds be it hydro cyclic or simple aromatic and you fair well nucleophile carrying living group as a nucleophilic centre. Then there is a likelihood reaction would proceed through week area substitution essence we have more example at the time, perpetually at towards end of semester and let us would take one more example one more example is a nice example.

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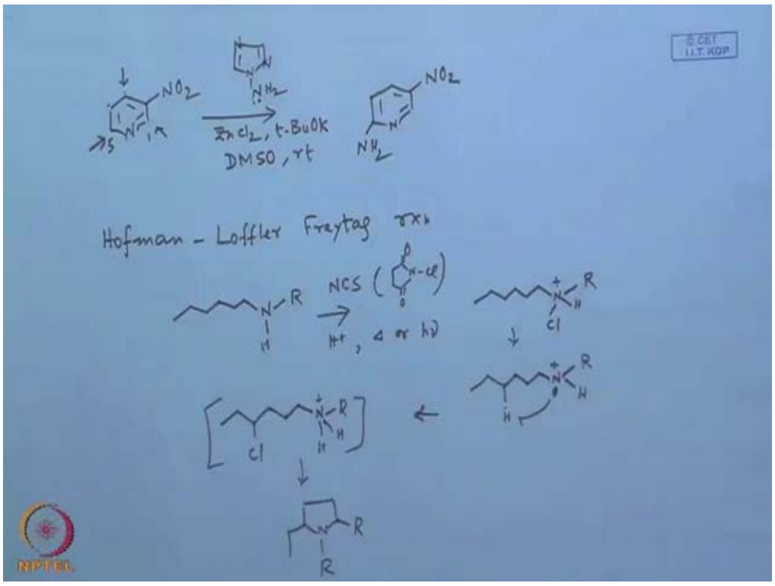

In this case separating hetero cycle separating hetero cycle it requires an nitro group and in the nitrogen all of us no it would express for in the c position and then, in this case this say a 5 member have to cycle again, 5-member have to cycle with this one amino here and beat of zinc chloride I think you can understand the use of zinc chloride actually being used to activate a nitrogen and what else do you require we require a best. So, in this case per potassium to oxide to b oxide and solvent is required in this catalyst in this reaction condition zero.

Now, so what do you expect, so if you do this little bit of playing with a residence, so what you will see that this position is electrophonic in nature this position is electrophonic in nature and this position all this 3 position are equally probable equally probable, but in this example the reaction has taken place at the 5 position. That means, 1, 2, 3, 4 and this is 5 position the reaction is taking 5 position. So, what is the product by now you should be able to tell me the name of the product sorry this name of the product.

So, you know a because, substituted reaction what I said you have to have a nucleophile having a living group at the nucleophilic centre, so you have to basically look for, now you have enough of hydro cyclic background in hydro cyclic chemistry has old chemistry electron pair is delocalized for the rain that is not have available. So, what is then available then here this do not have the free amino this amino group the amino group, so if this is the nucleo foil then what is the living group in this case living group is the hetero cycle itself that means, tradual the tradual is a living group.

So, what is a product ((Refer Slide: 11:15)) then product is ((Refer Slide: 11:18)) good very good that is it the v s is nice very good to have a emanation electrophonic imitations I mean all of us know hydrogen addition, but I mean normally I me n is to group by nucleophilic addition is very rare this is in this case it is. So, easy one can do it without, so then, so asking will have more example next time let us lo at one more I mean here all special kind of reactions which is attributed to the presence of nitrogen this is another reaction I think many of you know I guess this Hofman Loffler's Freytag reactions what is it.

So, basically what let us I remain if you if you do not remember basically what you have to remember then that nitrogen halogen centre nitrogen halogen centre this has to do the something like, so let us say you have and I mean with the free n h, so is a radical l kind of reactions deride. So, so long we had been dealing with we know of carbon radical carbon radical is main popular in chemistry of course, now this is a case of nitrogen radical.

So, how do you do nitrogen radical I mean all of us know nitrogen radical produced by simply in be a fitting if you do a enbiya fitting an nitrogen radical nitrogen radical. Now, between the two one of the oxide that is the halogen is more here, but in this case what you will see it is a case of interval co reactions, interval co reaction and if you take NCS is N Chlorosuccinimide in a mild and then beta little bit of acid and it could be heat or it could be light.

So, what happens, so you get the corresponding, so this nitrogen is protected and this, so what you get first n h hydrogen is replaced by M C S then you have an ammonium salt chloro ammonium salt which goes to this chloro, this radical cat an radical this cat an radical here r and r. What next photo photochemistry is typically I think you all know by, now I mean very few cases you will have exceptions it will fall either if 5 members or 6 members, that it this is a typical guideline in the organic photochemistry if you are thinking of interval co reaction just 5 and 4, 5 and 6.

So, I let us say then if you are radical here then 1, 2, 3, 4, 5, so this hydrogen would be obstructed this handle 1, 2, 3, 4, 5, 6, so now this hydrogen is obstructed and another you will have a have this is hydrogen of the here. So, again a hydrogen in this carbon and now you have basically hydrogenated product hydrogenate product, hydrogenate product and hydrogenate product and then during workup once you basify it, so you have 2 NH hydrogen, so you will see 1, 2, 3, 4, 5, so what you will get you will get a 5 member hetero cycle.

So, you get 5-member hetero cycle and this in the substitute here and you have another substitute here. So, this is that means, this is just an example of nitrogen radical we have been exposed carbon radical very frequently nitrogen radicals are not very common, but these are the reactions many times very useful let me give you one more or 2 more examples like say many of you know.

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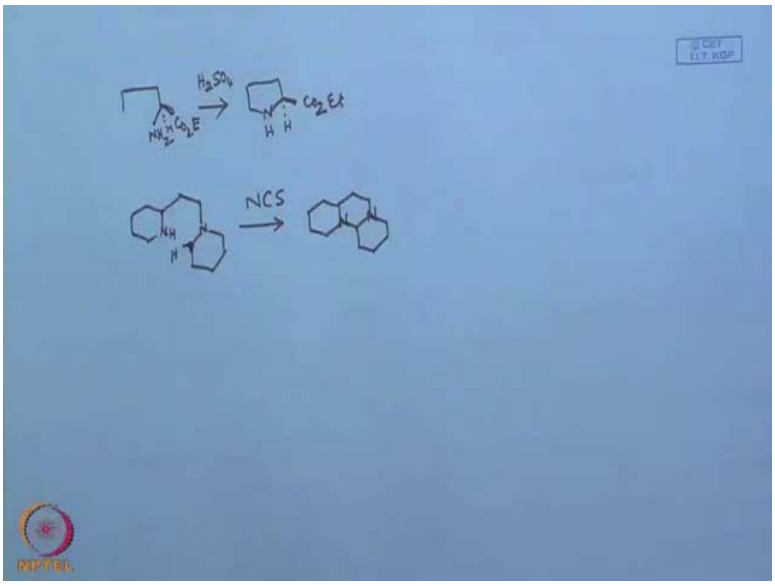

When you of this molecule what is this molecule polyester and an what is the configuration here this hydrogen, so hydrogen emphasis s, how do you synthesize this often you do not synthesize we do not talk about the polio synthesis then how do we get synthesis done from this obviously, you have a starting material is quite which is quite easy, but and the reaction as usual. So, I mean just if you lo at the use of the Hofman Loffler reaction in the starting material should be the corresponding this amino ester this ester here is NH 2 and this hydrogen and that is it, so simple.

So, simple I do not have the unity of this reaction here, but what you do of course, that this is important the progression is important once you do a progression the reactions actually undergoes nitrogen under this condition by ((Refer Time: 17:50)) compound is little unstable in colo compounds it will unstable be unstable. So, you proclaim that stabilize that then you then you do the radical reaction and then follow the rest of the reactions.

So, you get a 5-member hydro cycle 5-member hydro cycle and another special case may be let us say there is another space this is a special case it gives you 2 to important thing actually, it represents to important thing in this case once again the reaction is NCS this NCS, so what you expect. So, 6 members included in this case this case influence I mean, so radical is formed here then 1 2 3 4 5 6, there have actually there is no I mean there is no actually 6th atom hydrogen.

So, you have hydrogen in a 6th have means 7 then it will form a 7 and in this case another important factor you have to note that if you require that the alpha position of a nitrogen is stabilized alpha carbonate alpha radical and alpha carbon all these things intermediates are stabilized, by the nitrogen not the corresponding anion. So, constructing that that means, radical here at the alpha position of this nitrogen should be most able this hydrogen is obstructed, so in one shot you can get this ring close as done, so you will have a financing systems.

So, financing rolling system that will be basically you have 2 nitrogen in production systems is that much problem, so what is it tell you that nitrogen radical reaction could be possible nitrogen radical reaction will have more may be one or 2 examples, I think exercise will have example, but, so this is next is a very important one I mean hydro cycle can do anything. Hydro cycle can change the course of reaction changing course of the reactions.

Let us look at a special yes should be required should be required, but in this case is interval co reaction and I have no idea. In fact, that is what I was thinking actually the reference from where I got I think that is mentioned any because, basically interval co reactions, and then you have a double effect you can say the other nitrogen is dictating the radical formation. So, I just show first probably then immediately goes to the second radical that is than the alpha carbon radical. And then once you have this hydride triplet us for the formation of this thing probably I will check with, let us see one more surprise special reaction.

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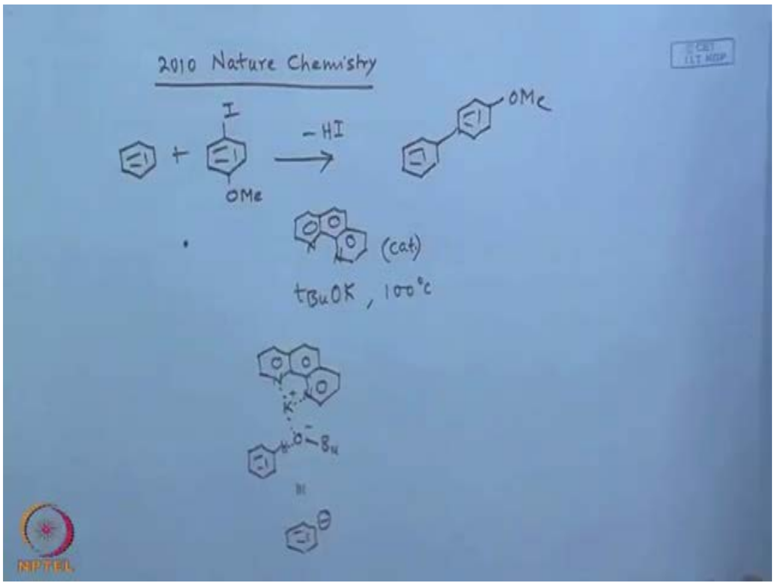

This is the reaction published in 2010 the journal very popular journal I do not know, whether you know or not this is known as nature chemistry. I do not know whether you have heard it or not tell me what is it you see very famous journal and if you premise will be famous overnight. Let us see this is a kind of reaction to a never heard of actually you have two. Finally, now we have a O M C here and add I here, so it is just simply aromatics this base many of you know that this combining 2 aromatic units this is a special topic in organic chemistry.

Because, it can simplify many major obstacles in medicinal chemistry and almost all I one of the aromatic ring is, now required for medicinal activities most of the medicinal agents will have at least one aromatic ring system. So, that is the reason I think you all know that last year we add 3, now it will working in the similar areas and let us see how to combine these two. How to combine these two that means, now the product should be something like this, so you see basically what you have to do you have to reduce this and by, now all of you know these 3 famous reactions.

So, Suzuki reaction Negishi coupling and egg coupling all of you know and this all the 3 couplings will have a you similar n products only the requirements on the left-hand side is different like recall. So, all of them will have high generate compounds all of them will have the high generate compounds, so and the only the new high generated are in etcetera etcetera, but in this case how to solve this problem what can we do any idea, now you have a origin fine and if you compare this reactions.

As I see with negsick I have all this couplings what you will find there is another commonality of all this reactions there all these 3 reactions required paradigm logy as a catalyst. Then we basically what is function of paradigm is to we can be carbohidrogen bonds from high school or honest level you have been learning the different hydrogenic attestable, s P 2 carbon atom because of, the resonance of the lone pair of the electron of the hydrogen is into the aromatic ring system this carbohorigen bonds are title bonds I mean not weak points.

So, somehow you have to make this hydrogen carbon bond to a weak and that is possible by instruction of paradigm into those once, so that is another first requirements of any kind of coupling reactions and to in this case how do you do it the another the I mean, but at the same time you have to have a nucleophile. So that means, once the carbon hydrogen bondage weak and let me there becomes use to fill you have to file equabond, so they what should be the nucleophilic bond then in the coupling reactions.

The incase of heck which one is the nucleophile are using in the suzuki it is the boron yet it boron yet means, actually yet complex of the boronegasitce and across the other for the negicy is the organ of zinc normally organ of zinc some cases organ aluminum etcetera. So that means, you have a, but where is the nucleophile here will bunion has to be nuclopoisson how to make it nucleophile I mean if you have good electro file in this case in this example.

So, at the ends of lines here know what you will do as this is I do not know this is something really peculiar though this one ten pennon throwly, so he add another base and is stanchion metrically H I is coming out. So, you have to arrest stanchion base and in this case the base is potassium toxic bet oxide, potassium toxic bet oxide and this is a one ten pennon throwing this is a catalyst, so you have a catalytic amount and then we will temperature required each again is this thin temperature that is 100 degree centigrade.

So, that s why this reaction is very simple, now it is within your control 100 degree means this is systematic temperature and the healed wise is very good I mean almost all is greater than 80 percent. So, you see that means, it would not need this add this paradigm zero etcetera all these things just simple, pennon throwing I mean you have been hearing about the pennon throwing from the analytical chemistry one ten from it is a nice complex ((Refer Time: 26:48)) in a article chemistry, so you see very commonly available to agent potassium taxied bet oxide also the commonly the agent.

I mean, so what we do I wish unbelievable reaction, so what is this n I mean, so there is no activation, now there is no activation of the carbon hydrogen bond, now what is an what is explanation, the explanation is at is enhancement of the basic property of potassium taxied bet oxide. You had a best potassium taxied beta oxide, you are enhancing the bass city of the base that is potassium taxied by using another hydrostatic base and the explanation that has been given is like this.

So, you have the anterior nucleus nitrogen and apparently it complex a with potassium for taxied beta oxide and potassium first get complex with get complex to with pennon throwing nitrogen, so obviously, this is plus this is minus. And assume to be we have a very interesting there and then he have benzene hydrogen they as if, so benzene hydrogen as if complexes with oxygen, so result is this is as equal violent to 2 kind of a thing as a this kind of a things phenol minus is phenol minus.

So, this is a this an explanation I mean it may be wrong, but at least this is an working explanations why this reaction is taking place of course, you can see a hydrogenic value weaker than and the, so that means, I am discuss again hydrogen is being base use as base. And it is enhancing the basic property of a standard base and what you is can do is this hydro-cycles I am giving basically yet time to see, now what are the other special cases what else you can think of we have.

So, far talked about peak value changes they never way participation you have talked about and all of us know that the modulation of the nucleophilic reactions and electrophilic reactions. So, likes if you have a peridian that all of us know, you see if you have peridian the electro field sufficiency are express at 3 position. So, see I think I will quickly.

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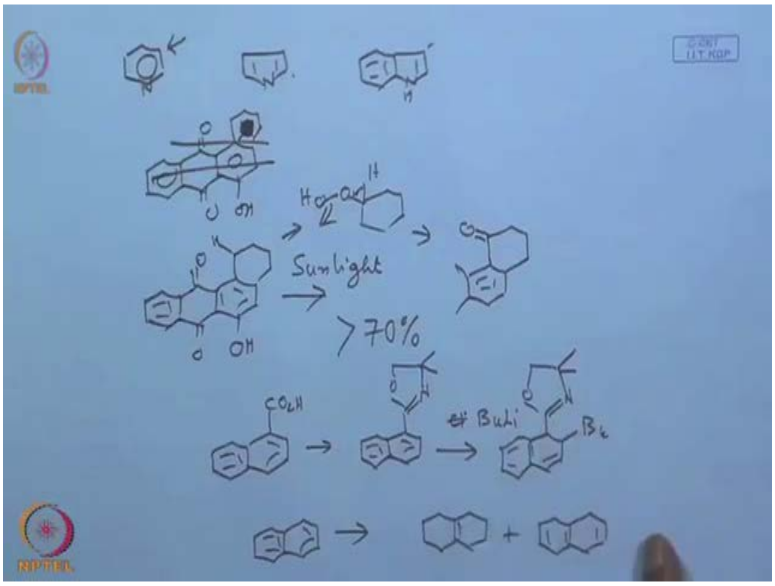

So, if you have peridian, so the electro field sufficient express at 3 position and then if you have pi roll and in roll etcetera if I have pi roll systems then the reaction express at 2 position and then if you have in roll let us see 5 and six sees together. So, it is 3 position, so all of us know, so that means, because of, the nitrogen the position of the electrofilic and nucleophilic centers change then there are cases of the reaction s the this like hofman loffler I have already said that is basically said photo chemistry like knowledge type one 2 knowledge type 2.

What is knowledge type 2 and knowledge type one that is a daily difference, but that is all this reaction s actually guided by all the title by heteroatom though you has to have an heteroatom that is one that is 2 whatever, you may be carbon will go you may be carbon will in one case, in the alpha bond is broken the other case beta one is broken the beta one did by the broken due to is like in we have we had done a reaction. So, this are all the effects of the heteroatom we are done a reaction of this kind and then in our rift up sorry this is not an you can take this that is heteroatom is a very important.

Atom it can be dictate lot of new reactions like this one and if you just put it at sunlight take a solution of the compound take a solution of the compound and then put it on the doing a day light. What you expect it is a nice reaction and the yield often more than, 70 percent exactly what you do it you had a solution of core function of this material in a test tube and the tube, whole power you take a piece of popping plug and they voltage toward put in bicker and it was left in the roof then around 5 6 hours after which of the t l c the starting the l is gone you get a nice product.

If you look at our papers you will see very nice reactions there very selective reaction impurely most cases if you is an upstaging agene there are all kinds of possibilities all kinds, I mean in the next tomorrow you will talk about oxidation in hydro cyclical chemistry you will see it diverse range of oxidations reactions. When I see diverse range of oxidation reaction is for examples, d hydrogen is an oxidation reaction because here pulling out the hydrogen.

So, likewise the plenty oxidation allegation you have oxidation reaction basically, so next time you will see the at least 10 15 different kinds of a oxidation it will be taking place if you have a nitrogen. Similarly, you have oxygen of here actually if you follow this, now this type 1 and 2 1 2 3 4 5 and 6, so specific the reaction at a takes place at to give you this of here, this actually you get the hydro peroxide this oxygen this are this is a real probably gets converted into this difficult to comment many times.

Of course, this regular oxygen is sensitize d to singled oxygen singled oxygen, but in this pistol that is singled oxygen input or not just I want 1 and 2 introduction easy difficult to say, but the intermediate would be of this kind intermediate to hydro peroxides. Once you dedicated from it look at the hydrogen from the oxygen from the air and it will and all of us, can guess this water comes out and goes to the, so then we have talked about taxied amino effects and in the 4th here.

We talked about the serious unaffected I think one of you know that it has to bearing to this one serious an effect yes heteroatom it was hydro cyclic chemistry. We have talked about the mass region this was again hydro cycle it was a nitrogen it can undergoes serious on with never on carbon ion etcetera. It stabilizes the and the like one of the examples could be in one of the examples could be suppose you have a you can carbolic acid carbolic acid.

You can convert this into this by, now you must be knowing you have nitrogen of here oxygen and this is called in order it will also the 6 members see means you have to one can also think of the 6 member here. Now, put let us see methyl lithium I write butyl lithium horizontal butyl lithium what did you expect ortho possible yes this is in case of, actually it is not, so that is a another possibility there this means this is, now basically a kind of sift base electro file actually in this case what do you explain just d arbitration taken place, so you see g arbitration taken place.

So, you get a D arbitration box that means, only partially d arbitration you take place simply because, you can guess because, at it be a benzene you would have expected artholipiance like what you said, but it is not a benzene case naphthalene case naphthalene case. How do you differentiate naphthalene in benzene in terms of principles less louder resolution. So, d arbitration is e g f, so that is why in if you are following my work another our work you will see most cases.

We try to de arbitrage the naphthalene part simply because this easiest to do let us say many of you know this coupling reactions arrival bi level coupling acidic coupling when you acidic you must have hard take between naphthalene at peruicurite what you get pylon, but why not be the phenol. So, if that actually the phenol coupling acidic coupling is tougher because de arbitration, so here in this case this possibility is there and what you get is the pasture de arbitrations.

And this are de arbitration tougher again one of the o h 2 de arbitrage this molecule is what box seduction box seduction will have you know it will reduce extensively 2 a c plus where it. Is completely de arbitraged means completely sorry de conjugated completely de conjugated essentially in bats in aside you will have a product with a single out bond for example, if you do a box seduction weak napselon, so I think this is a net nice gate question what is the product not a one 4 is this normally it comes to their rounds.

I mean of course, yes you can arguably say yes there are some amount of could be this at any case, but essentially some other to this one arbitrage I mean amino. So, has to be that means, any case you have less world define product here this are he products, but in this case you get nice world define product and partially this are de arbitraged and the last topic here very quickly this is today is a lost topic I think we will.

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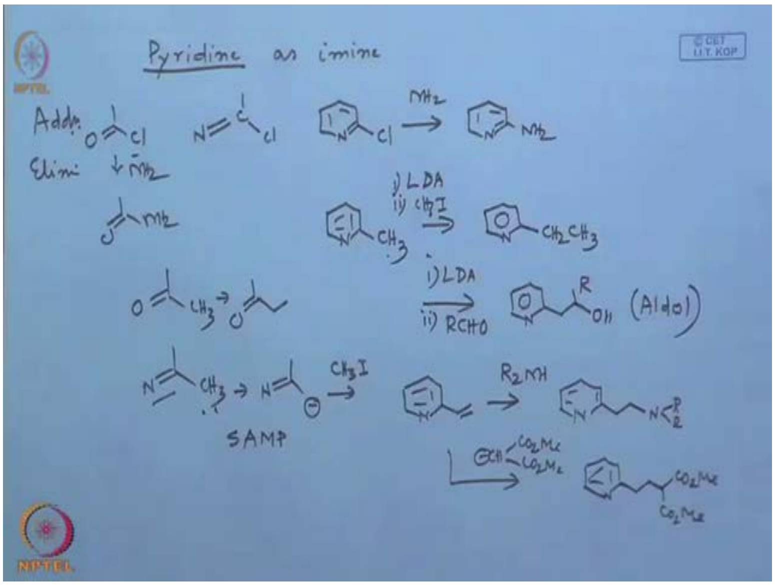

Talk about this pyridine case little bit pyridine is a as imine pyridine imine when I say, so that means, when I that imine means all of us know n equal c 6 place and if you look at pyridine. So, you have a nice 6 base here, now if you have 2 chloropyridine and NH 2 I think without new time chlorine would be replaced by a NH 2 analogy you can think about I have to say just like a acid chloride for example, or a c chloride, so example if you react with acid chloride with n h 2 minus and you just form a corresponding m i 2.

So, it is just base the pyridine is equal violent to a structural function or might I mean rather you mean carbon nitrogen. So, that means, to say reaction typically called I think all of us know a addition and elimination reaction fine and then also i think by now also know you know that if you want to do an homologies an steady let us say begin with that is a this one to be fact pyridine to chloropyridine CH 2 and Ch 3, so what cross coupling would do or anything simply reaction.

So, it is just like a just like again then let us say acetic ((Refer Time: 41:14)) for example, if you have a key tone, so how to homolog get this l d a and with are added you just pull out the best here before added. And similarly, you can just take nitrogen and n h 3 here mean and then you can pull out the best here, hydrogen and from the carbon and then do the this alkylation study, so this we already study before in first year, I remember what is that some no, no I think SAMP.

((Refer Time: 42:14))Now, last class how do is very good yes ((Refer Time: 42:30)) very good, so actually what would you do if formulation in form this hydrogen. So, once you form the hydrogen essentially, you get structure of this kind, so the structure and you have in next have carbon and hydrogen, so because of, the function you get this c activated to an it is easily de propitiated it.

Similarly, in this case you do de profession here LDA and then equal amount of with are added mind it you have we have to also keep it mind, that is a probity of nitrogen allocation suppose you take 2 methyl period in add we are added, what you expect the importance will be produced what nitrogen will be produced fermi coordination solved. So, we have, but once you have carbonate up here then the allocation should be proceed in this manner.

And then similarly, it take again LDA is quite standard dioxide, now a days and then take r d height, so typically what will find this is a this is a reaction which and R, so what is this reaction, so you can say aldol reaction. It is very similar to this aldol reaction and what else do you expect to flow that period in is and mean there are other reaction and, so on like a if you let us say react these hymnal pyridine the hymnal pyridine.

And then let us say R 2 NH then see, now look at this nothing in both are, now nuclephilic ammunition to the double bond perfectly all that means, you say sort of micro addition kind of things what you will see is R and R and micro addition. I mean similarly, are you just take dignify melon at, but will find micro addition again, so micro addition again micro addition we taking place and, so that mean, so I mean all the indication all this reactive profiles are analyze with this means are equivalent to carbon l group basically.

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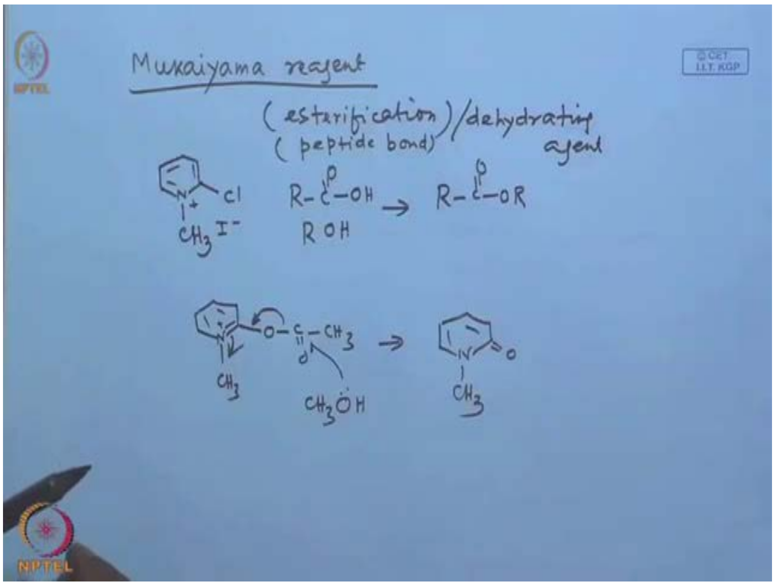

So, the carbonic and the last example today last example and mukaiyama agent I told you what is it again is hydro cyclic molecule is in hydro cyclic molecule and this structure would be like this to choral that means, just like an acid chloride just like in acid chloride and let us say aquacade salt and, so and we compare an each this one. So 2 add one methyl pyridinum added pyridinum what is the use, isolation is that could have being important one though, but in this actually this is a agent for a estarification reaction.

So, if you take carboxylic acidity there means carboxylic acidity and let us say alcohol, so what would see we get that is it and also sometime it is a used as a dehydration agent basically it push up the water, it is a water and methyl wise quit simple basically have sometime also we used for a making peptide bond sometime you have see in a table on this, so essentially we say equivalent to. So, it will pick up water from raster sorry for acid an all fall of from the might carbons to during the peptide formation bond formation and the mechanistically is, so mean and acid chloride.

And so, it first active carbonic acid, so what will see and equally displaced by carbonic acid the oxygen and you have CH 3 of this is it, so oxygen gets a replace this chloride and, now are this is this pyridinum as good living group. So, just take hydrate kind of thing and. So, then let us say we have methanol methanol, so what you expect this goes to carbolic acid and then, so the byproduct here is by product here is per don 2 methyl per don.

So, and then this I mean this is not popular, but in most many cases and this has mean preferred agent advantages like one of the advantages that this can be period of can be easily recover are easily separated. But, if it let us say work in D C C many of you know that is serious problem in, d c what is the problem D C C die cyclo carob daemon why you solve actually not many or installment many are installment, so and, so that take care of these most of these effects of nitrogen and then there is another special effects that is executed by nitrogen as radical reaction carbon radical reaction.

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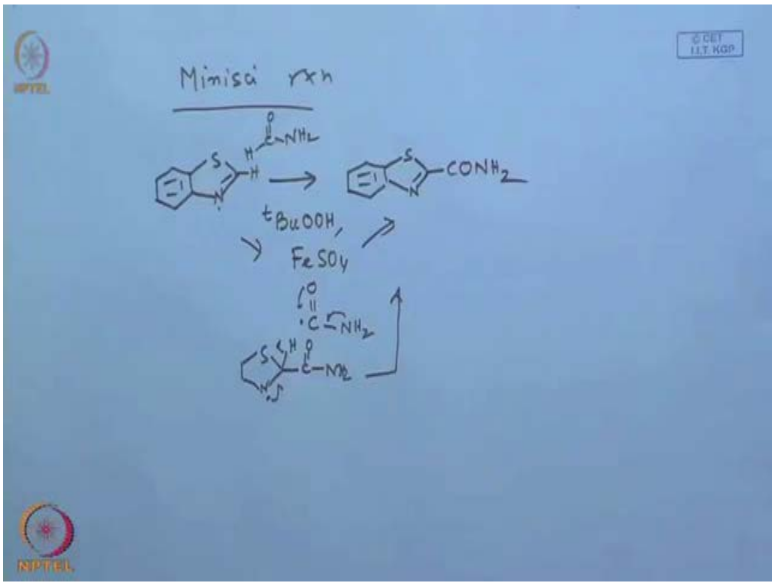

And the reactions is called minisci reaction, minisci reaction what is it basically produces the this is the carbon radical, let me just given example which is quite striking line let us say we have a compound actual not sorry bilge high casual high will have 2 hydrogen menisci oxen. Now, let us see you want to this into a or functional lives, let us say and this a adding a carbon at specific position and if you lo at the structure will see all the carbon are non equivalent none of the because of, the presents of the sulphir and nitrogen this is all this carbons are non equivalent in terms symmetric.

So obviously, also it should non equivalent terms of deactivate, now you want accomplish it transformation where it will incorporate a might group at this 2 position. So, how do you do and of course, there are solution plenty of solution then I am talking about I will talking about to a reaction actually, so specific in nitrogen chemistry especially in a radial chemistry in a nitrogen radical is a stable, radical when we talked about the of hofman loffler reaction we talked about this nitrogen radical is very fairly stable especially if you have nitrogen close to aromatic ring system.

So, this in this example let us say starting material is starting material that is it thermo might where is studying where is cheap studding how to coupled them, if you look at basically I mean if you 2 taken atom counting, do an atom counting what you will find, you have to do hydrogen which is equivalent to an oxygen reaction oxidation reaction. So, you have to in oxidization agent an oxidization agent means you have to look for the chemical hiring out of the top owner the predictable.

So, oxygen are metal oxidize or metal oxygen and then you oxidation agent is oxygen ozone ideal peroxide oxygen material and ideal peroxide is one of the commonest one. But, in this case that is say will hydro peroxide simply because, there most ideal also in benzene compare the agents also in benzene have you seen no benzene solution, and then just not enough you have to activate the how do it, what is that no you all know how to decomposed hydel peroxide no sorry sulfide.

So, you put a iron just front end agent it say hydrogen very simple and if you just add this, I think needed and in one step we will get this what is the intermediate. So, you will actually you will have peter example very use full hydro chemistry many time I think we have talking about these in 4th year why radical chemistry is very use full in chemistry, another agents why the because, is very selective if the reaction expressed certain place.

It will express at that place number 1 number 2 the agent is light that is possible other thing is that this water, this can be water that is the advantage it cannot pick up these water hydrogen water is because, polar hydrogen. So, it cannot be, so when you have a sort non polar hydrogen it will pick up nicely that is another advantage second advantage third advantage radical chemistry quick hydrogen force here normally, it does not cause any elimination reaction beta elimination reaction.

If it is best can the beta living room, but radical reaction rather of course, are there, so you see an in these case what is happening radical is being produced at the carbon centre the carbon centre have navel nitrogen probably, that also in both oxygen nitrogen probably oxygen. And nitrogen probalized radical probably and that is also technology used also if radically stabilized by electron.

So, what is the name very good captor radical possible that and then once it add go the another system, so what will find. So, the radical is stable then we have, so you have a, now radical and next what again this hydrogen is lost by the oxidizing agent and the driving force here is again acrostic. So, you have is this reaction such have taking place, but essentially reaction is, so you have, now see in nice way of nice way producing a carbon radical. So, will have more example next let us spoke you have come later also, I will come before I had started earlier make it point next time like tomorrow will meet at 3 o clock, so you come at 2:45.