Fundamentals of Environmental Pollution and Control
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Lecture No. # 05
Water Pollutants (Continued)

So, we start the discussion on where we left yesterday that is about the nutrients.

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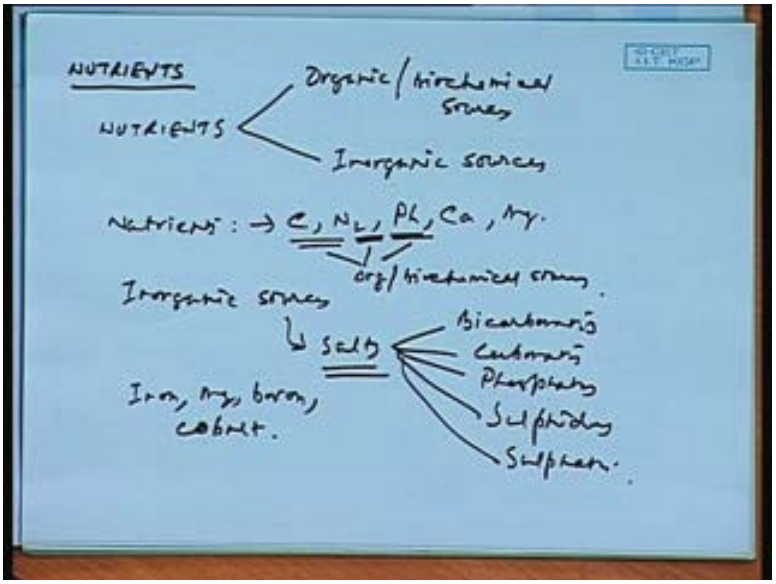

The nutrients that you know I was also explaining you about you know what are the different types of nutrients and what are their implications like you know eutrophication that I discussed with you. Now as you can see you know this nutrients or this can be coming from both the nutrients if you just write like this nutrients, nutrients come from different sources like you know organic, organic or say you know biochemical sources, biochemical sources and also inorganic sources, inorganic sources.

Inorganic sources right in this organic or biochemical sources that we can explain so you know it's something like you see the mostly, this the nutrients like, nutrient like, nutrients, nutrients, many of the nutrients like specifically carbon nitrogen, carbon nitrogen you know you would require say you know you would find we will not consider a hydrogen or such because it is a constituent from the water so carbon nitrogen we can find phosphorous also from this and this there are, there are many other sources as well this is organic sources you know mostly will find some of this calcium magnesium as well. But generally what we can see is essentially this nutrient these are, these are specifically obtained from the organic sources carbon and nitrogen, phosphorous as well to a certain extent phosphorous we can find out from different other sources from organic or biochemical sources.

So I make a distinction here by say this when we say the inorganic sources, inorganic sources are essentially the sources like you know coming from the inorganic sources. So you can treat this you know it's an organic, organic or biochemical, biochemical sources. Inorganic sources as you can see mostly from the salts, all kind of salts can result into say this typical kinds of salts, all kind of salts you know as you know this bicarbonates, carbonates, phosphates, sulphides, sulphates all these you know would lead actually would provide inorganic sources were also you will get a number of important constituents like you know iron, manganese then boron, cobalt, cobalt etc. Now why I have been saying this is you know why I have been saying this is essentially to understand that no nutrients have a great importance in environmental pollution and control, essentially because the nutrients, the nutrients you know completely disturb the, disturb the balance, the natural typical balance that we generally observe. Say you know in such cases like you know if you just observe that you know if it is a, if there is a water body, if there is a water body say now having, water body having sources from think of sources coming from different areas like you know if this is a water body we find you know this just consider that you know these are the conduits you know which are actually working as sources for this water, for this water.

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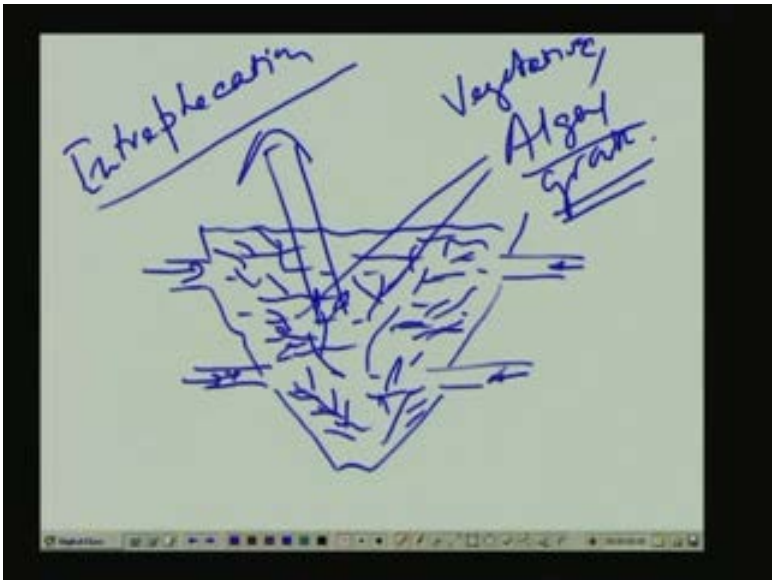

You can see this you know what happens finally is if the particularly in the nutrients that are necessary for the algal growth, the necessary for algal growth you will observe that you know this the algae related say plants, plants should begin to grow more than the others. That is what I have said say this is particularly you will observe if you just observe few things like you know to give a very good example, you just go and observe in a particularly see this algal, algal growth, algal growth or vegetative growth, sometime you can also say it as vegetative growth, increase, increased vegetative, vegetative growth, increased vegetative growth. What essentially it does is so where you can see in, particularly for your simple typical example if you just go to nearer place of a (Refer Slide Time: 06:30) or you know in a particular to it in a restaurant place or something.

If you watch the water I mean water you, water is being logged at one place, the water that has I mean that has been I mean naturally stored for some reason at one place you will find that the water is thick, water is essentially thick it looks greenish, it looks greenish and this is because of one reason that the water, that the water that is being supplied from the sludges from the restaurant or sludges from the hotel they are highly rich in nutrient. These nutrients is sufficient to increase, this nutrient makes a particular population of algae's, a particular population of vegetation to grow very rapidly in the water. and as it is taking place as I have said this would finally lead to, this would finally lead to all the situation, finally lead to what we have seen eutrophication.

We have discussed about eutrophication. This has been, this has a very important, this has been a very important aspect of planning for water pollution control. The reason is this you know there are many times like this not only that I have said a source like restaurant, there are many kinds of you know in agricultural production also nowadays, in agricultural production we are adding number of, a huge amount of fertilizers to just to here tell you one thing just because you in many cases we do not know how much of the plants would require as fertilizer. And similarly in all countries since the fertilizer is subsidized, so you know people generally tend to over use the fertilizer. And this fertilizer, unused fertilizer they mostly don't, many of them are highly soluble in water. Whenever you come in contact with water they are sufficiently soluble.

If they are soluble, they would finally lead tract which would finally lead to some water pond or water sources so or river, streams like that. So what is happening is there is a considerable degree I mean considerable degree of increase in nutrients in the streams, lakes, waters, water bodies and things like that. As a result of which, as a result of which this kind of eutrophication is a very common phenomenon nowadays. You go to any construction site, you go to any as I have said near any factory you know particularly say particularly in a sewage treatment plant, near a sewage treatment plant or any other aspect, any other areas where there is a sufficient discharge of nutrients, this nutrients as I have said this can be solved say you know in a sugar plant or any other plant this may be an organic source.

In some cases if they are using salt a number of different kinds of salts are being used. In such cases this salt should add to the growth of the nutrients, add to the increase in the nutrients and this increase in the nutrients would finally lead to the increase of, would finally lead to the increase of, finally lead to the increase of the algal, algal growth, this algal growth, algal bloom that I have said and would finally lead to eutrophication. So, in nutrients you know this is, this is what is of a significant importance as such. Well, I mean as to say another important thing is to say observe here is about this nutrients will come back about this nutrients little bit in an differently related, related work in a related area but another important thing is these many of these nutrients, many of these, many of these nutrients, nutrients when absorbed by a living, living organism, many of the nutrients when absorbed by a living organism might lead to the lack of, lack of, lack of adsorption like lack of adsorption of another essential nutrient, essential nutrient.

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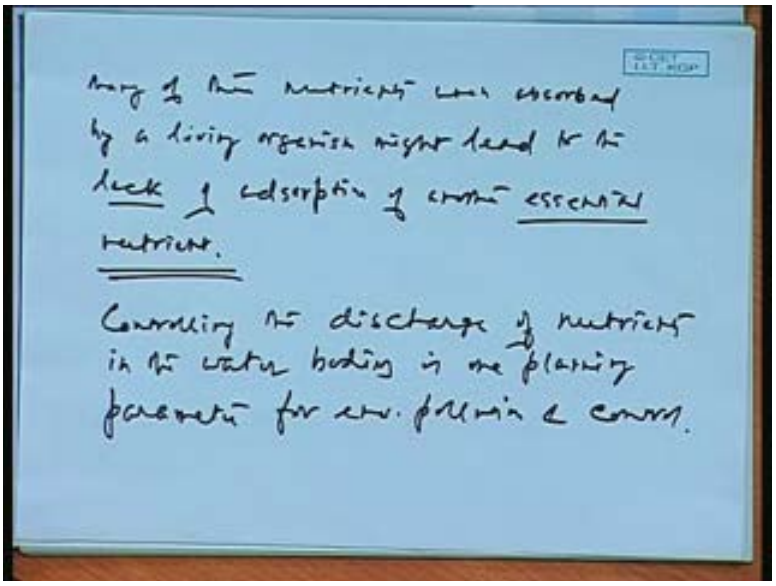

This is very important, also at the same time many of the nutrients when adsorbed by a living organism I mean, I mean much of the nutrients when it is being absorbed by living organism might lead to the lack of adsorption of certain essential nutrients. So if you are increasing if the body a particular organism if it is, if it is accumulating iron from, from the water, if it is accumulating iron from a source it might reduce the intake of calcium or magnesium. So, not only that you know you would be one organism might suffer from the increase, added intake of a particular substance like you know the substance like iron and element like iron but it would also suffer due to the lack of intake of other essential nutrients, other essential nutrients. So this is, this makes another important, another important thing, this is so controlling, controlling, controlling the discharge, controlling the discharge of, discharge of nutrients in the water bodies is one planning parameter, planning parameter for environmental pollution and control.

So, essentially you know if you are, if you are trying to keep your water regime, the source of water to be good I mean the source of water to be drinkable or available for right use, you need to also control, you need to also control the discharge of nutrients in the water bodies. This is, this remains as one important area of environmental pollution control. That is you know not only that all nutrients are, nutrients are not sufficiently, nutrients when taken when it is available in the right proportion in the water it is good for our use. It is good for the use for many microorganisms, organisms as well but when it is high, when it is very high in water what it would do is it would only support the growth of a certain kind of organisms, certain kind of organisms either you know the plants or you know a plants or animal source that might lead to meet to situations like algal bloom, like meet to, that might lead to the situation like eutrophication, okay. So apart from that you know there are generally increase in the nutrient, increase in the nutrient in water does not have a consequence which is you know can be related like you know a very serious consequences but it can have nagging problems, it can have nagging problems like you know, you know in certain surroundings, you know certain surroundings, surroundings were high, high iron is available in the water, high iron is available in the water, high iron this can lead to digestive disorders.

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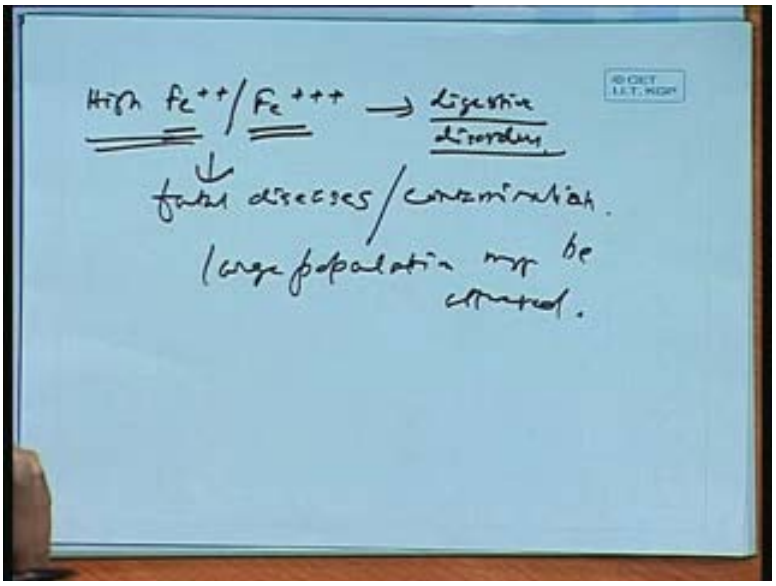

In many cities you will find in the households, people install desulphurization, deironization plant where the iron is, the concentration of iron is reduced. So this is increase in the iron in higher doses of iron does not lead to any you know any kind of, any kind of fatal diseases, fatal diseases or contamination but might lead to nagging problems, nagging health problems and essentially effecting a large population, a large population, large population may be a, may be effected, may be effected.

For most of the nutrients that we know if there is an increase in the concentration of nutrients, it does not cause to any kind of serious health disorder but it can have a nagging health disorder like you know the disorders like that would continue to remain with the physiological system for a long time without actually leading to any event like you know event like fertility or things like that, okay. So this is where you know this is where one is the nutrient is important, only one thing is you know particularly nitrogen, the concentration of nitrogen at some point, concentration of nitrogen in some point in water might lead to some this is typical type of health problems and let me explain that. This is the typical type of health problems that we generally observe is you see high nitrogen, you see nitrogen, in nitrogen in water is available, available only in ammoniacal form.

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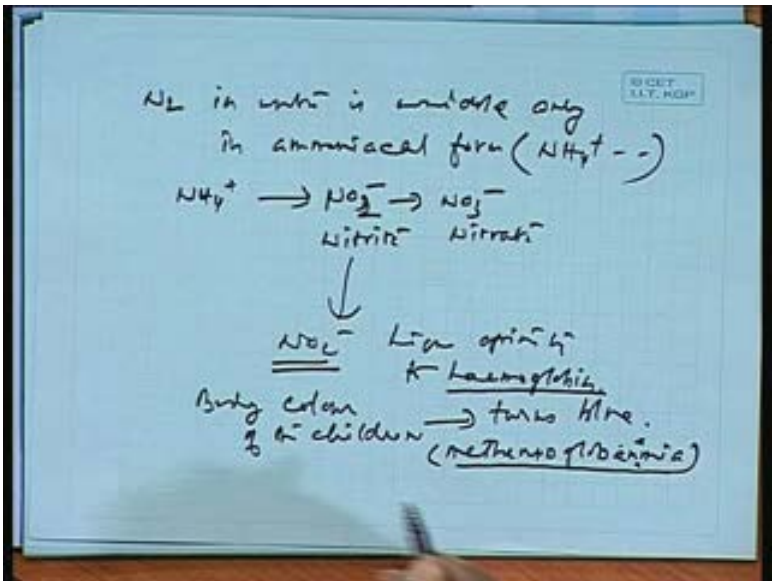

So in order to, it would be essentially you know it would be available as say mostly like a, something like a radical which is NH_4 you know it would be generally available as NH_4 you know so as you can see this particularly, this ligand as such this particular ligand you just observe now this NH_4, this NH_4 in a particular situation in water this can finally leads to this is, this is NO_3 and this can lead to you know this is lead to NO_2 minus and this would finally lead to NO_3. So nitrite, it would be a nitrate ion first, this would be a nitrate.

Now this nitrite if it is available in the water and if it is, if it is drank, if it is drank by a sufficient quantity by any child or below 6 years of age, below 6 years of age, their body physiological system being somewhat you know frazzled till that point of time, this would be, this would lead to, this would, this would lead to, this nitrite, this nitrite has a very high affinity, high affinity, high affinity, high affinity to hemoglobin is very high as a very high affinity to hemoglobin, very high affinity to hemoglobin, this high among hemoglobin this high when the body in the, in the body of a child, when the body essentially body of a child begins to accept, begins to accept or has accumulated a huge, a good amount of nitrite in its hemoglobin, this can lead to a particularly a diseases which is, which is known as the blue colouring, you know is generally they leads to the body, body colour, body colour of the children, body colour of the children turns blue, body colour of the children turns blue, this particular disease is known as methemoglobenemia globe ene, methemoglobenemia enemia, these disease as you can see which should lead to reduction in the oxygen in the blood, reduction in the oxygen in the blood can be fatal.

Generally, the children below the age of 6 years, below the age of 6 years susceptible to this kind of diseases. So it is very important particularly for the children below 6 years of age to see that the water that they drink contains very little concentration of nitrides and essentially the nitrates are essentially where the sources of nitrates, essentially let try to understand this. There are two important elements you know that construct our body, two very very important elements that construct our body and that has a very serious significance with water pollution.

One of them is certainly carbon that you know, this is a carbon you know forming a carbon and water forming the basic, basic hydrocarbon and from that basic hydrocarbon only you know other hydrocarbons form, other hydrocarbons which are generally you know the help us in the construction of the body. There is another substance you know which is very important for our, for the growth of the body, for the sustenance of the body, the physiological growth that is you know is the, is nitrogen. The nitrogen that you know is that helps us in the formation of the amino acids, the proteins that you know the form, from the amino, from the amino acids only the proteins begin to form, so these proteins are absolute essential for our body.

So whenever a body decomposes fastly the carbohydrates containing lack of nitrogen would be begin to be decomposed. After a certain time, after a certain time body is the concentrating, the features of the body containing the proteins and the another amino acids would begin to decompose. When these begin to decompose in the state of decomposing if the water would be enriched with substances like substances containing nitrogen and in such cases the nitrogen may be at point of time may be enriched with nitrite. When the nitrite would form, when the concentration of oxygen in the water would deplete.

The concentration of that situation is concentration of water, concentration of oxygen in the water has decreased and the nitrogenous substance has increased, in such a cases will find higher incidence of nitrites in the water. This water enriched with nitrite can lead to a fatal disease like you know the blue colouring disease that we generally know or the methemoglobenemia that we have discussed would can form. So but this is, this is just to say this is a disease for the children only, mostly the adults are not affected by it, but a children a child when it crosses the age of 6 the danger of this kind of diseases almost goes away but till that time I know of one, one patient who a particular child who was, who was so suffered in such a case you know the only remedial measure is to keep the child continuously for 6 to 7 days under heavy intensity light, so that the body can recoup.

This is the body can begin to form oxygen, the concentration of oxygen also increases in the body and as a result of that the effect begins to, by that time the nitrogen comes out of the body and the oxygen gets assimilated, so the normal respiratory function, normal physiological functions begin to take place, okay. So that this is the role of nutrients, this is why the nutrients are when it is in a sufficient or sufficient concentration they are extremely useful for us because in the water if it is the water is without nutrients, the water is of no use to us essentially because many of for our physiological construction the many of the elements many of the elements actually we derive from water.

So water needs to be if a, that is why distilled water is of no use to us. So the water has to be, have some nutrients but when these nutrients increase, the threshold increase an, increase a particular you know their concentration begins to increase and increase in such cases the nutrients can be essentially huge problem okay.

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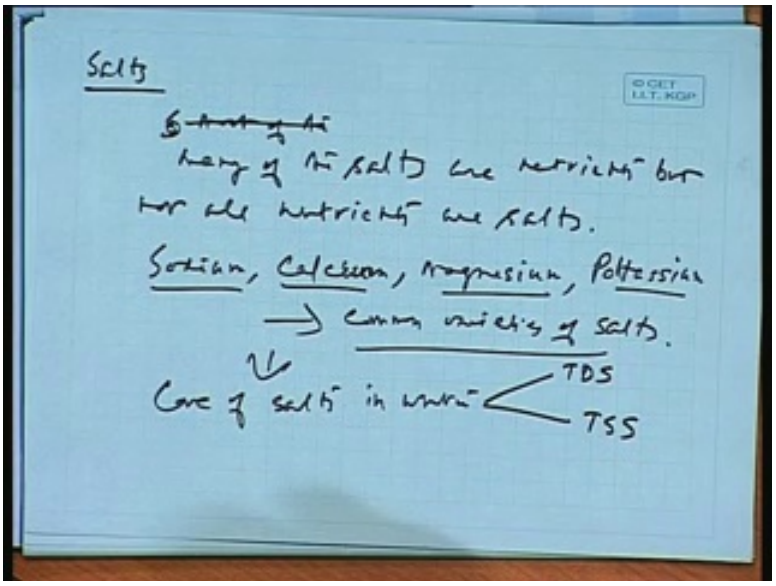

In the related term you know this is if we just observe this that you know this particularly the salts almost related to nutrients, a many of the nutrients I think to differentiate all this is that a many, most of the salts, most of, most or many of the salts, many of the salts, many of the salts are, many of the salts are nutrients but not all nutrients are salts, okay. Just to make a distinction, just to make a distinction you know there is as I have explained also in the case like nutrients many of those nutrients may be the source may be a salt but not all nutrients are salts, there may be nutrients may be of other varieties also the nutrients may be as I have said the nutrients are not necessarily you say many hydrocarbons are essentially nutrients, many hydrocarbons are also nutrients.

So you know is this all of them are there, some of them are salt but not all of them are, not all salt are essentially nutrient. We have this you know particularly the salts that we have generally discussed about is you know this is the sodium, calcium, the common calcium, magnesium, potassium are the common varieties of salt, common varieties of salts, right. They are that the typical a common variety of a salt elements you can write they are not necessarily you know they would be they are in the form of salts, so you find sodium chloride, you can find you know sodium phosphate, you might find sodium carbonate.

So similarly calcium, calcium phosphate, calcium carbonate whichever are generally dissolvable in water and in the form of a salt will be available in the water has to be, they has to dissolved in water and should be in the form of the typical salts basis is like in carbonates, bicarbonate, sulphide, sulphate and you know you can name almost anything here there be huge verity of salts that are essentially available. So, as I having said all these having said this calcium right with this basically is we generally term them in a typical term, you know concentration of this concentration of, concentration of salts, concentration of salts in water, water when it is, when in many cases salts in water they contribute two things. One is, one is the TDS which is dissolved portion of the salts another is TSS the undissolved portion of the salt.

There are many salts which are undissolved, so if this is below the saturation value in water they would remain, remain suspended, they would remain floating, they would be essentially available in the form of a suspended form.

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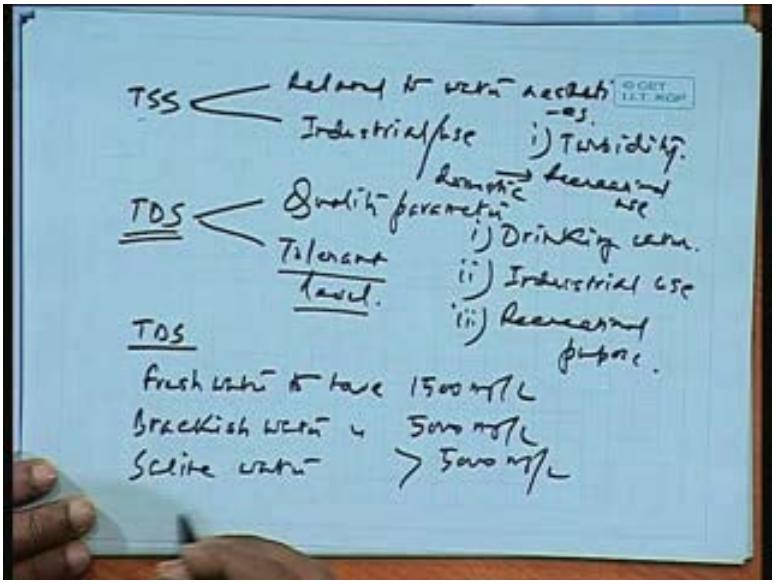

So this if it is suspended TSS this is about TDS, so as I have, as we have discussed you know earlier in the classes also this TSS, TSS is a, is a of essentially of you know a related to, related to, related to water, water aesthetics, aesthetics like you know the typical term that we know is turbidity related to water, related to aesthetics like you know which you cannot be used. So, the certain kind of also you know various parts you know industrial use also in related to not only aesthetic value also of industrial use but this, this, this suspended and also is industrial use, industrial or in an industrial or domestic use. If the water is you know high TSS, you can take, you can there in some cases it might be allowed to, one to take bath on that with that water but the suddenly the, you would not be allowed to drink the water okay.

So when you are going to a pond and taking a bath even at high TSS, you might be taking bath but you are not generally supposed to drink that water okay. So this is the different distinction it makes. Similarly here in case of TDS as I have said TDS is essentially a quality parameter, is essentially a quality parameter for say both say for drinking water purposes, drinking water industrial use, industrial use etc. Industrial you can say here in the TSS part you can also write down another use of that is recreational use, you might concentrate you know particularly if it is, if we are, if it is a natural pond or a natural water body you might not be very concerned about the say TSS in that water but if you are just you know if you are using the same water for say a water park or things like that there you may be interested in TDS also. So in a, in recreational purposes also recreational purposes also the water, this water this TDS may be important recreational purpose. So TDS is essentially a, is essentially a quality parameter also related to TDS is the tolerant level, tolerant level. So, tolerant level is you know every, every species, every every, every both in the plant kingdom as well as in the animal kingdom if you just see that you know they have a certain tolerance to the TDS.

Say if you are, you just, just you observe this is something that tolerance is like this. If you have a glass of water, if you are, if you are a dissolving one spoon full, a small spoon full of salt you might still take the water okay may be of say you now with some lemon and things like that that may be a good drinking water you know you would like the water to drink but if you are adding two spoons you cannot tolerate it any more so in such cases this is just to just to about, about having test but the physiological need also is depends on the tolerance. So not all, all organisms, not all plants species or not all animal species have similar tolerance level, they have different kind of tolerance level as well. That is where we just like to have a particular level or we would try to understand a TDS total dissolve solids in a, in a more comprehensive manner where we generally try to say is we have characterized say in terms of TDS, in terms of TDS we have characterized fresh water to have, fresh water to have say about 1500 milligram per liter fresh water, brackish water, brackish water, brackish water to have up to 5000 milligram per liter and you see this saline water that is, this is brackish water, saline water is more than 5000 milligram per liter and also that we know of the sea water that is sea water contains about 30000 milligram per liter, sea water would have about, sea water will have about say 30 to 30000 to 34000 milligram per liter.

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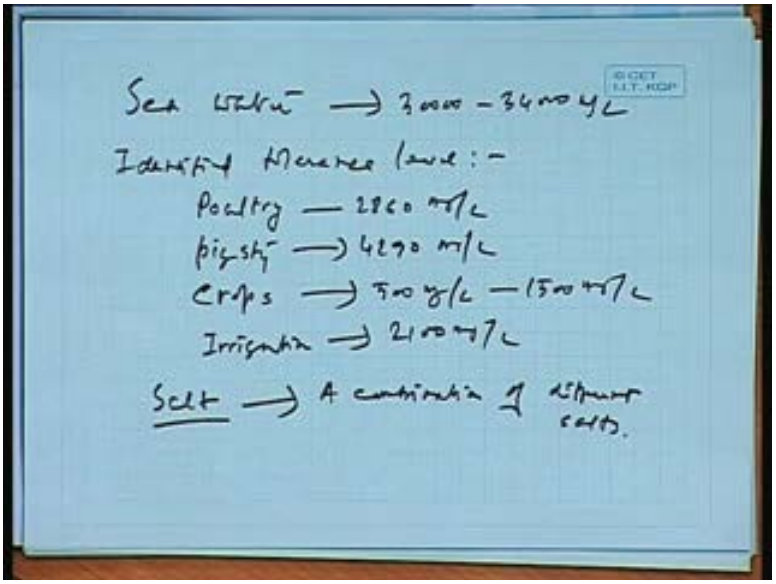

Similarly at the same level if you just see that you know mostly this is tolerance levels you know identified tolerance level, identified tolerance level for most of say you know poultry. Poultry if you are using the water for poultry this should not have more than this concentration, this is pigsty where the pigs are generally they kept 4290 milligram per liter and this is in a, if it is and crops, the crops between crops is between depending on the different varieties of crop we generally have identified tolerance level is about 500 milligram to 1500 milligram per liter depending on different types of crops.

So you can see if it is, if the, if the TDS is more than this, so in such cases the water would be mostly unusable for our purposes and so most of this is for irrigation, general irrigation, general

irrigation the tolerance level accepted or the tolerance level generally followed is this, irrigation about 2100 milligram per liter.

So this is you know this is the typical concentration of this, typical concentration of TDS or the salt in water. This salt is remember when you say the salt here, salt here is not necessarily a single typical type of salt, a single salt, salt would not mean necessarily Nacl sodium chloride or you know common salts like that. It's basically a combination of, combination of, combination of different salts, combination of different salts which can be which are of importance, which are of importance, which are of importance.

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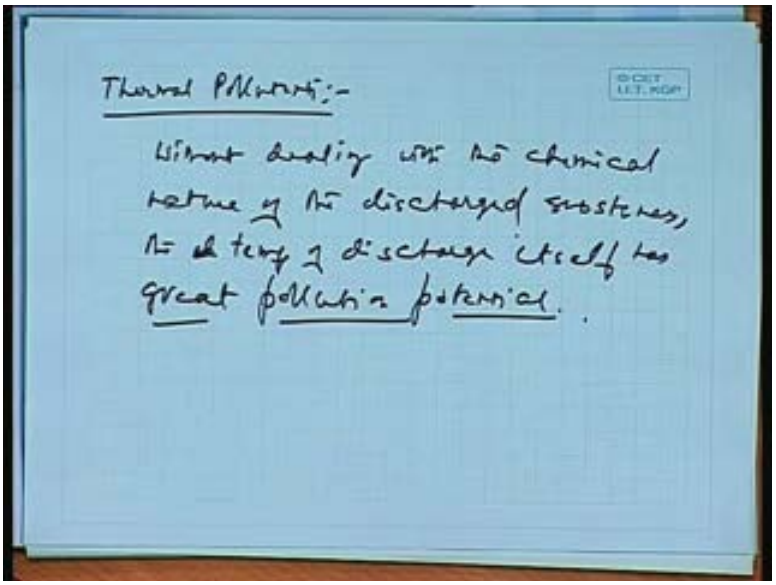

In some of these salts you know you would also discuss the salts of certain heavy metals. We will discuss in a different in a, in the, in the class now and we can see you know before we move on to this, we would also see this thermal pollutants, thermal pollutants, high without dealing with the chemical nature of the discharged substances without dealing with the chemical nature of the discharge substances. The temperature, the temperature, the temperature would discharge itself has great pollution potential; the temperature of discharge itself has great pollution potential. We are not merely discussing about, we are not discussing about that chemical nature of the discharge except that you know if their mere temperature has a significant impact. Temperature has double impact in fact you know the temperature is one important thing about temperature is that this if you just observe that you know in a particularly in a case like this, if you just observe in a case like this you know here you can see you now if in a body of water if it is if it is, if it is a particular discharge is taking place, a particular discharge is taking place in a body of water like this, in a body of water like this what happens is this is you know you just to say if it is T say T_i, this T_i being you know it has a temperature here.

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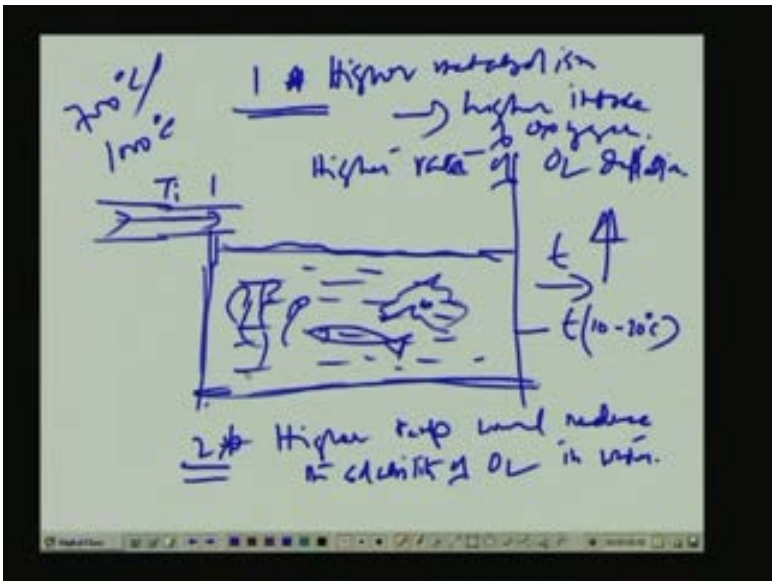

A normal temperature say temperature of say between say 10 to say 10 to 20, 25 degree, say 10 to 20 degree centigrade and if you are discharging a certain substance say certain mass of substance of say you know about having say 1000 degree centigrade or say when 700 degree centigrade like this in such cases what we observe here is the two things takes place. As the temperature increases, as this temperature, as this temperature begins to increase, as this temperature begins to increase it begins to go up. Here two things take place, one is higher temperature leads to higher metabolism of this species available in water, this can also you know substances or you know there is plant species, small plants this higher temperature, higher temperature would lead to higher metabolism, higher metabolism this at high temperature, the metabolism rate, metabolism rate of the species available in water begin to increase.

So, the two phenomenon this higher metabolism, higher metabolism means higher intake, higher intake of oxygen, higher intake of oxygen and as a result of that, as a result of that and so this is, this would be you know the oxygen depletion would be at a faster rate, higher, higher rate of oxygen depletion, higher rate of, higher rate of oxygen depletion, higher rate of oxygen depletion, this is number one reason. If you say just see you know there are second reason here, if you just observe the second reason that higher rate of oxygen depletion you would take place and also on other hand higher temperature, higher temperature, higher temperature would reduce, would reduce the solubility, solubility of oxygen in water so would reduce the solubility of oxygen in water okay.

So, the oxygen which is generally feebly dissolvable as we have explained, this oxygen would be further deflated. So there are two impacts that we can observe from these thermal pollutants which can result into you know a very damaging effect on the species present in the water, species present in the water. So, we can see now these two things add to, add to the further to the difficulties present in water. So this is about the thermal pollutants, there are you know this is just to explain about you know the nature by which this thermal pollutants can impact, essentially as you can see that this also we can also write down another important thing here is

there is the thermal pollutants, thermal pollutants also, thermal pollutants also increase increases, increases reactivity, increases reactivity of certain elements.

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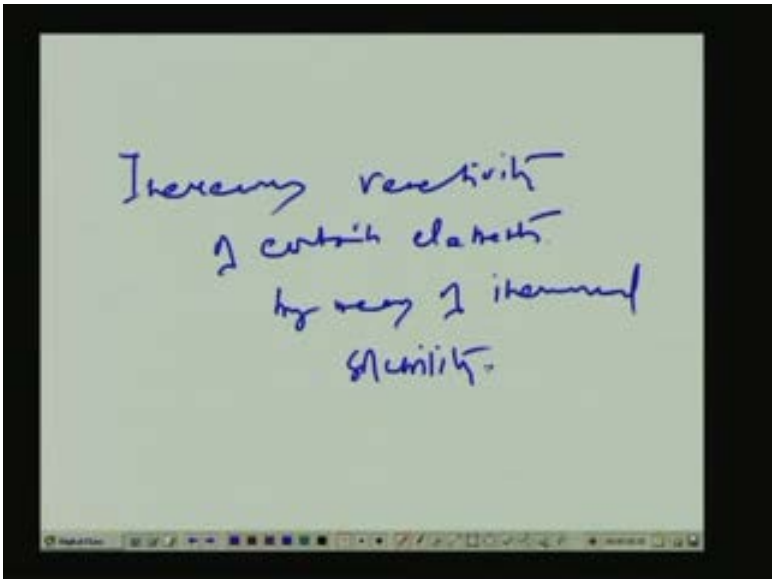

This is reactivity of certain elements by means of, by means of increased solubility, by means increased solubility. So you know you can see that the substances which are not soluble at that temperature, at that temperature would now be soluble. So solubility of other nutrients, other substances would increase in water that would also have an effect on the reduction of oxygen. So this is what you know in irrespective of what the chemical constituents of the water we can still observe that these thermal pollutants can have similar can have a different kinds of effects. In addition to, in addition to other toxic effects they might inherently have, right inherently have like you know a highly discharge say in a coke oven effluent, a coke oven effluent you know when it is discharge if it is not treated, when it is discharged may be the temperature is at about say 1000 degree centigrade or 900 degree centigrade and still having lot phenol in it. The phenol itself is another damaging pollutant but this should include to, this would give rise to the shear increase in temperature would also have a more more serious implication.

Now having gone from there you know the next pollutants that we would be is a thermal pollutants except for thermal pollutants will come back to another very important aspect, very important aspect of our discussion you know for particularly related to engineering, engineering sciences is generally except you know civil and sewage waste kind of situation.

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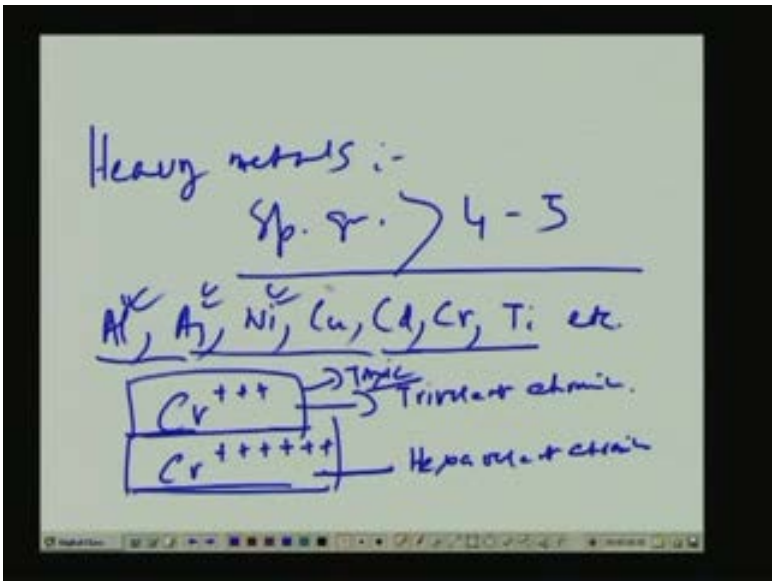

Here it is the heavy metals, heavy metals, the heavy metals as you know, you know they are this heavy metals are generally known as the, which has the specific gravity, the specific gravity more than 4 or 5. There is no essential distinction about one being a heavy metal another not being an I mean when can one can clearly demark it, one has a heavy metal another has not is but generally for our purposes we will find that that you know the specific gravity if it is, if a particular specific gravity of a certain metal is more than, more than 4 or 5, this should be generally termed as heavy metals. The heavy, typical heavy metals that will be mostly discussed is you know this many of them which are basically highly toxic aluminum, arsenic, nickel, copper, cadmium, chromium, nickel, cadmium, chromium, strontium, strontium, thallium, titanium T_i etc strontium, thallium, titanium, etc. These have, these are known as heavy metals but remember another a, another a very important thing here, another is, another very important thing here is that not always heavy metal species are important, heavy metals are not always the heavy metal itself is very pollutant like you know in such cases like chromium 3, chromium having valency 3 chromium having valiance, say valence the valency 6. This is called hexagonal chromium, this is called trivalent chromium, this is called trivalent chromium.

So, this, of this, of these two species one of them is extremely toxic whether the other one is not, whereas the other one is not. So you know in such cases we find that you know in most places a trivalent chromium would be toxic I think this one is the toxic one, I'll again in a different class I will discuss about this but you know just to know about at this point of time, of these two species one of them is extremely toxic where the other is extremely non-reactive in nature, one of them is exotic and another one is non-reactive. So you know it's not always that a heavy metal itself is always a pollutant but a heavy metal can be toxic but you know there are certain species of many heavy metals which should be which are essentially highly toxic will, we'll briefly stop for about few minutes 2 to 3 minutes then will be begin to the next class where will again start right about discussing about this heavy metals.

Preview of Next Lecture:

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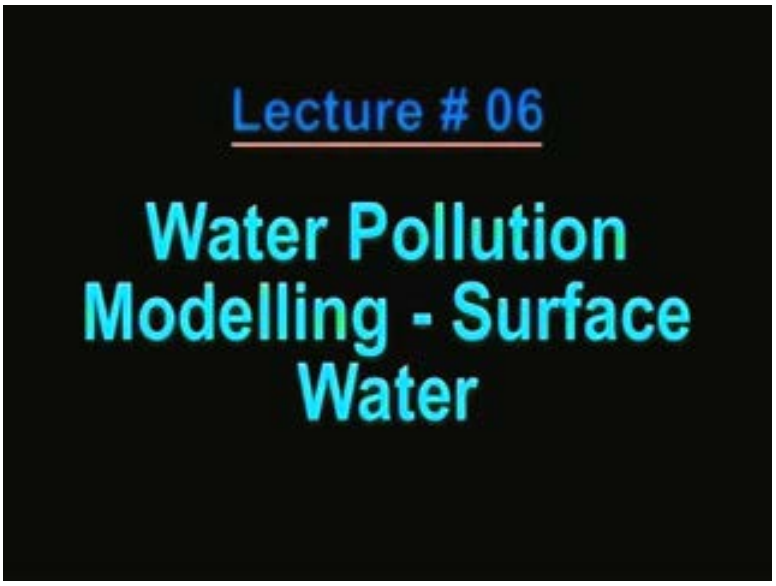

It will begin I mean I think you see there, the thing is you know you have little more thing to say about the water pollutants will continue by that but any anyway I'll to start with this you know let me make a correction here there you know this one is not the toxic one.

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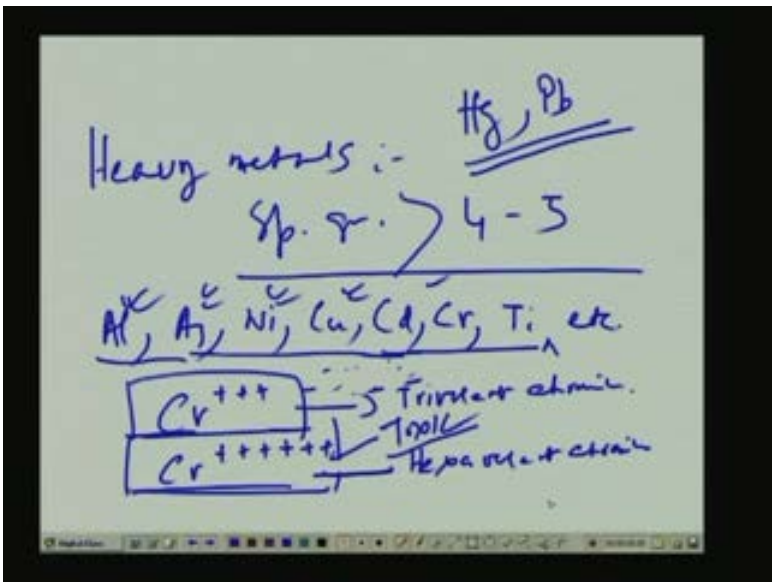

This one is, this one is toxic, this one is toxic and also in this part here I have not included two very important, two very very important heavy pollutant, a heavy metal pollutant like this one is mercury, one is essentially mercury which is also a heavy metal contaminant and also is another

is lead, so the lead. So this mercury and lead please include them, these two are important, important metals these are two are a very important heavy metals which are a toxic to, toxic to many of them are known as toxic to human body or toxic to any other kind of organisms like I will just explain you a case study here are also similar to this is this you know if you can see this okay.

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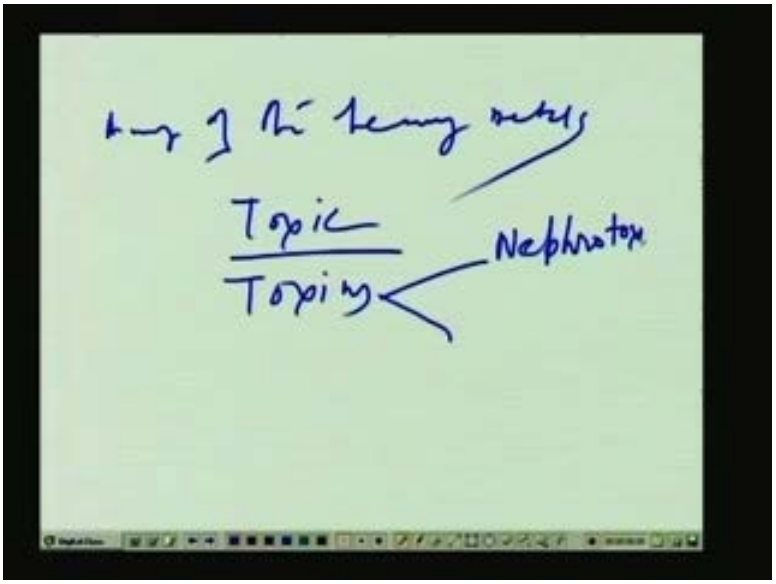

Now what happens in such cases of mostly you know in cases of heavy metals, one of this, many of this heavy metals many of the, many of the heavy metals, many of the heavy metals are you know a toxic, toxic which has toxic which has they are identified as, they are identified toxins is, identified toxins that they are, they can relate to nephro toxins, no longer required in a big industrial plans where they extract gold, non-gold, non-mercury gold extraction processes are becoming more and more common. But in small practices in small uses mercury still remains a very important substance which is generally used for extraction of gold, one of that such situation is you know is a typical case where you have seen you know in many cases in India also you have seen that you know this people, poor people by the river side they generally use pans for gold panning for you know to collect nuggets of gold that are generally done.

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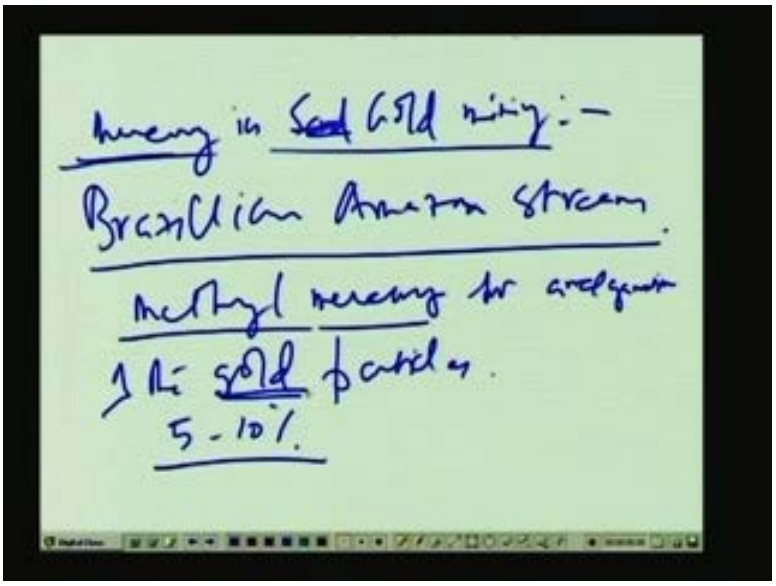

But this is particularly true in a, particularly very common in Brazilian, Brazilian, Brazilian Amazon, Amazon streams where after Brazilian Amazon streams where you know this part kind of mining is very common, this kind of mining is very common. What is done is one is done generally is this is the methyl mercury is, methyl mercury, methyl mercury is used, methyl mercury is used for amalgamation, amalgamation, for amalgamation of the gold particles, methyl mercury for amalgamation of the gold particles are generally used right. Now this methyl mercury mostly about 5 to 10 % is used of the concentration that is generally used for the purpose of amalgamation of the gold particles, the only 5 to 10 % are used you know which form a bonding with the gold particles 1, 2 - Dichloro ethane.

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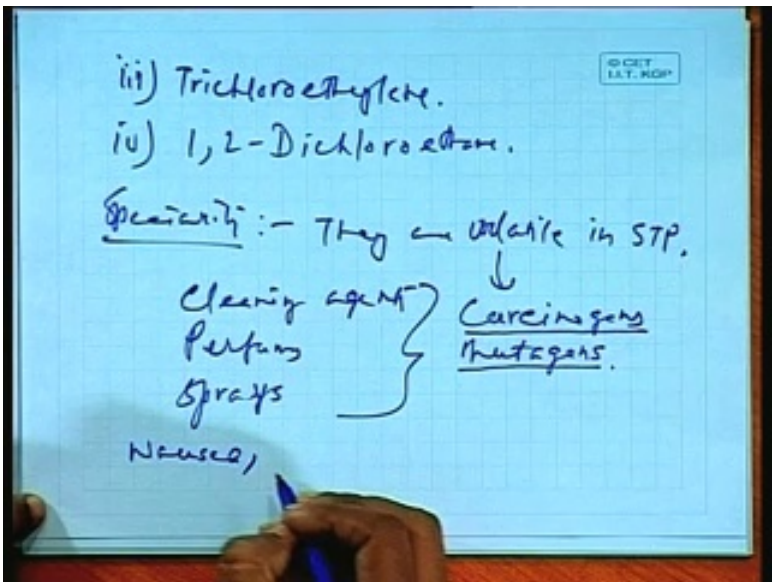

Now what is their specialty? Specialty is, specialty is they are, they are volatile, they are volatile in STP standard temperature pressure that is why they derive a name of, they derive a name of volatile organic compounds, volatile organic compounds, volatile organic compounds. They are essentially organic nature but as you can see they may have say this may, they may halides in them they may have say they different types of chlorinated substances, they might have you know any other substances you know organics they might also have some organics in some cases.

So if this can be, they can have certain metals, metallics also in that. This specialty is that they are volatile in standard temperature pressure that is very important. What are those cleaning agents? Cleaning agents, many cleaning agents are basically this volatile organic compounds, this perfumes, sprays, perfumes, sprays and they are and many of them are, many of them are known as carcinogens or mutagens, carcinogens or mutagens, carcinogens or mutagens. What is this mutagen all about? The mutagens are you know, this mutagens may be not leading to carcinogen, not generally leading to a carcinoma or cancer but they can also have local changes, local abruptive changes it can take place, local abruptive changes they can take place. So usual phenomenon you know particularly of this apart from being a carcinogen themselves they have, they cause nausea, this is the vomiting tendencies, this is nausea the vomiting tendency.