Chemical Reaction Engineering 1 (Homogenrous Reactors)
Professor R. Krishnaiah
Department of Chemical Engineering
Indian Institute of Technology Madras
Lecture No 35
Multiple Reactions Part 4

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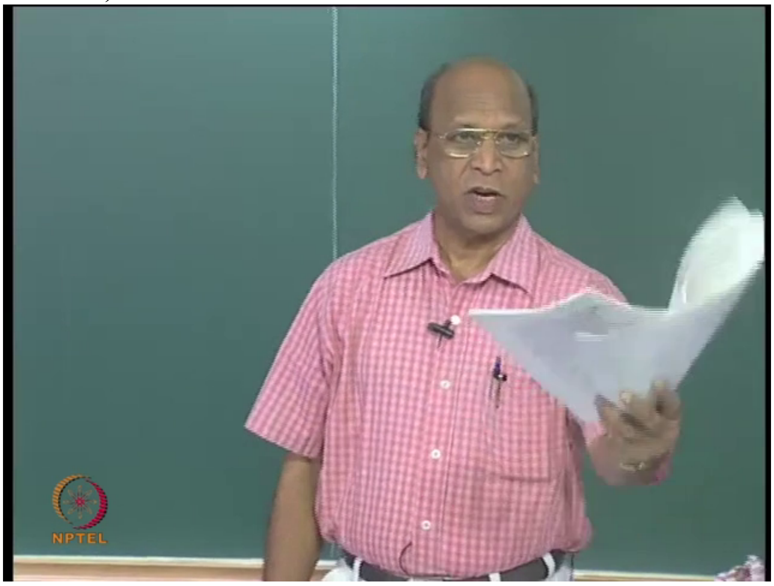

Yeah we will start this example what we were about to do yesterday, Ok please take this example. Let us see so that you know some of those rules what we have learnt probably slightly more clearer now.

Consider the aqueous reaction A plus B going to R and S, this is the desired one. We have d C R by d t, you write there, you know in the opposite to this, equal to 1 that is k value. C A to the power of 1 point 5 C B to the power of point 3 d C S by d t equal to again...so both are in units, units of the rate are given as moles liter minute, Ok rate units.

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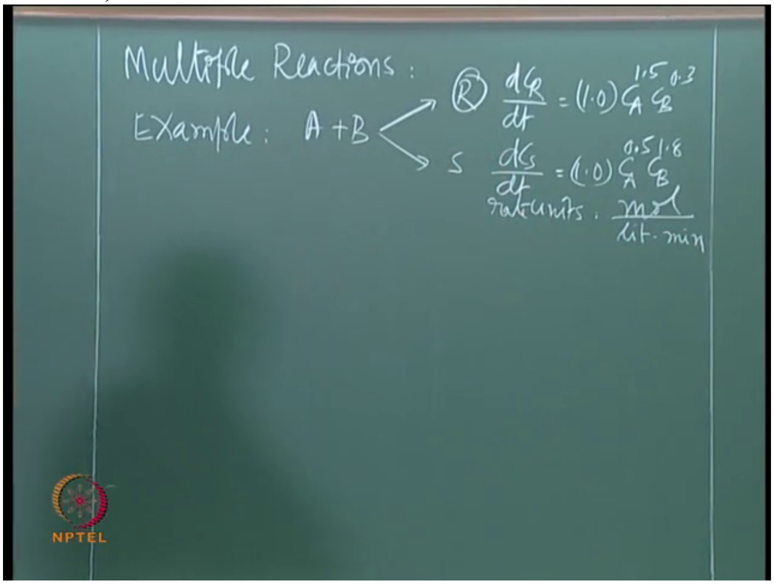

Good. This is the problem.

Then please write below. For 90 percent conversion of A that is X A equal to point 9,

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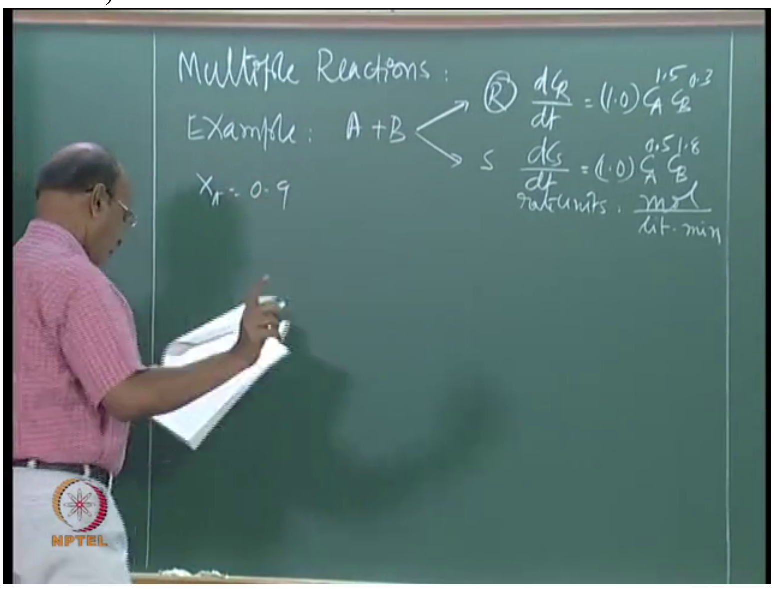

X A equal to point 9, find C R in product in M F R and P F R.

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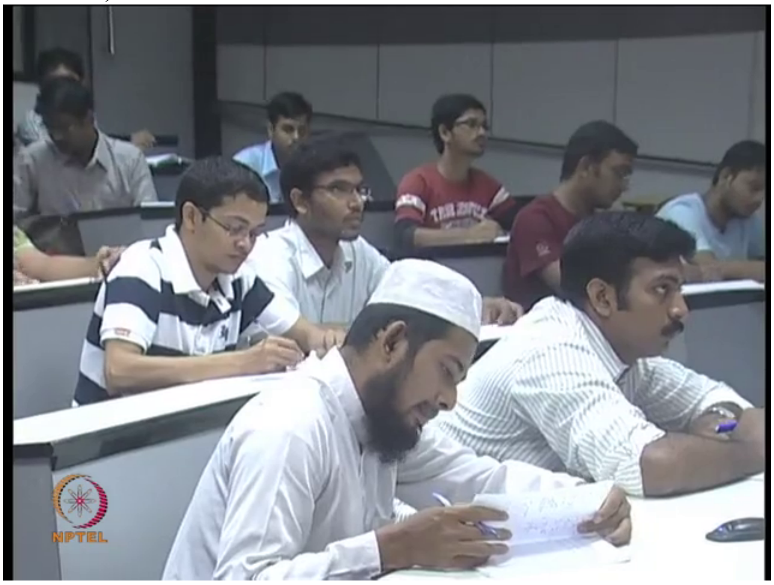

So, I mean I can also ask phi P. Phi P means once

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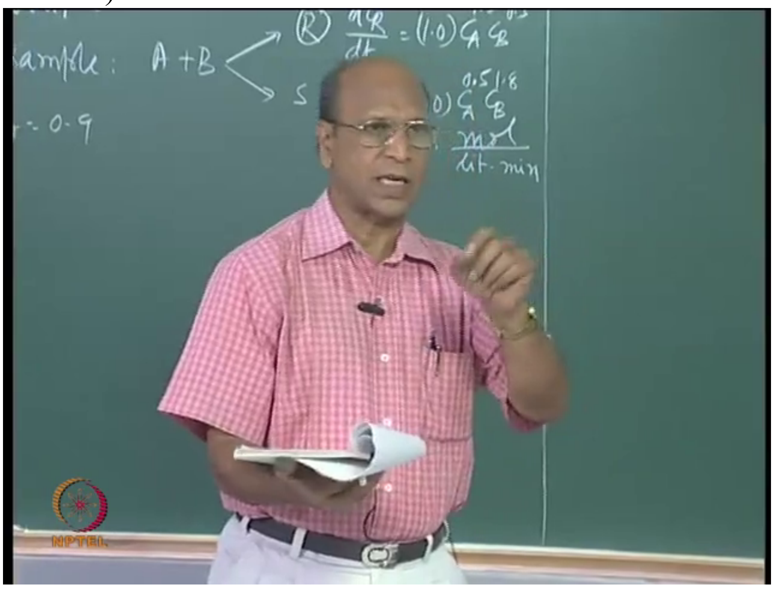

you get C R, C R divided by, C A naught will give you of course that yield 1 and C A naught minus C A f will give you yield 2, Ok, good, yeah.

Then please write below. Equal volumetric flow rates of A and B are fed to the reactor and

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each stream has a concentration of 20 moles per liter of reactant, right.

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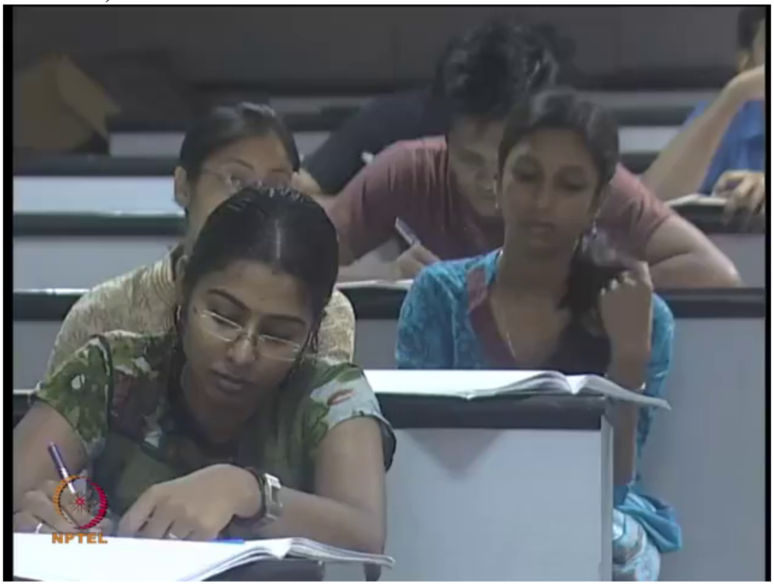

Yeah 2 streams are coming with, 20, 20 moles per liter.

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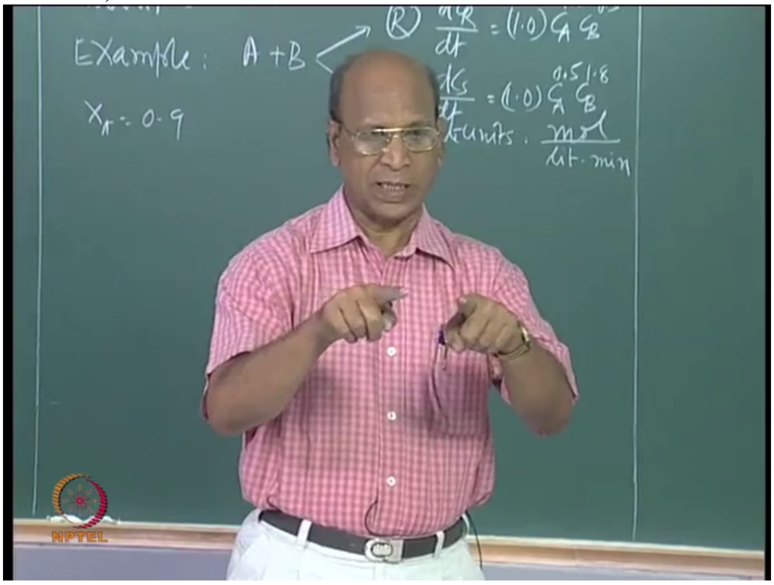

They join and then enter the reactor. So what will be the actual concentration that is entering? 10 mole, 10 mole that is why be careful about that.

That is simple mistake you do that in the exam and you think that you have done correctly. And if marks are not given, you think that teacher is not giving marks. These are the very simple things which you may not even know that that you know you have to take the two streams together.

When two streams are meeting

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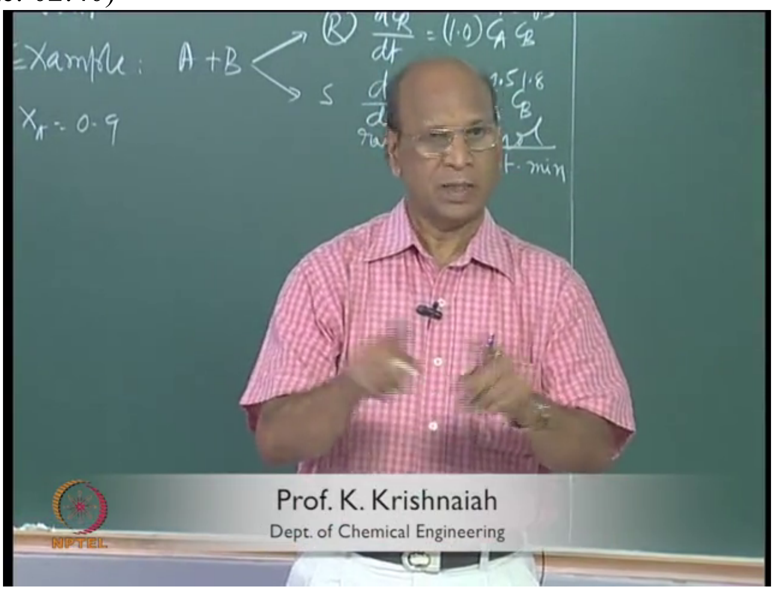

then average will be, because here same concentration. If it is not same concentration then accordingly you have to calculate. Ok, one is let us say one third and another one is two third like that, then the concentrations again different, differ.

So I am just warning you. These are the simple things where you may forget, you know in the examination and you will not forget in the examination if you do all the assignments. Because that is experience. You are doing that yourself. You have come across already one situation. So that is the reason. Ok.

So that is the one. And Ok, I will write here C A naught, actual C A naught that is entering equal to C B naught equal to 10 moles per liter,

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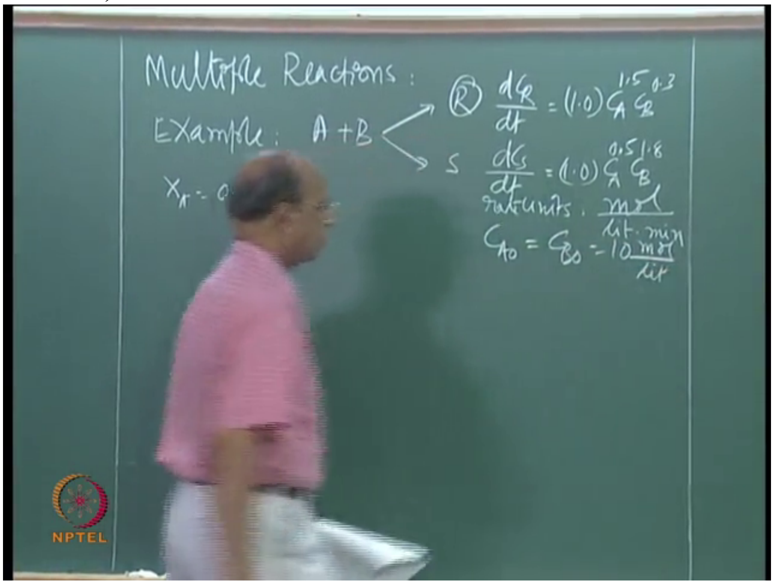

good? Ok the definition of instantaneous yield, sometimes we can also write like this, so that means C R by C A, Ok, yeah so then I can write also this one, we have this equation already, d C A,

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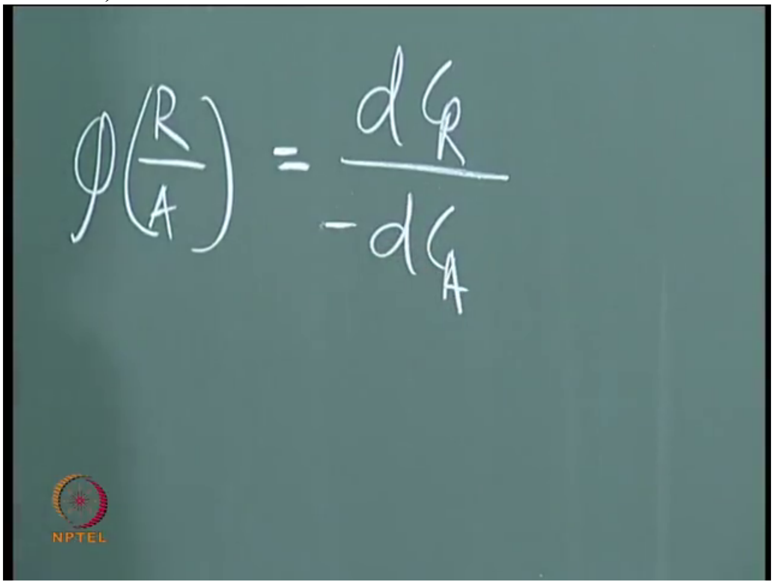

not S Ok, d C A and this also can be written using, because I know these two. Ok.

So actually A is

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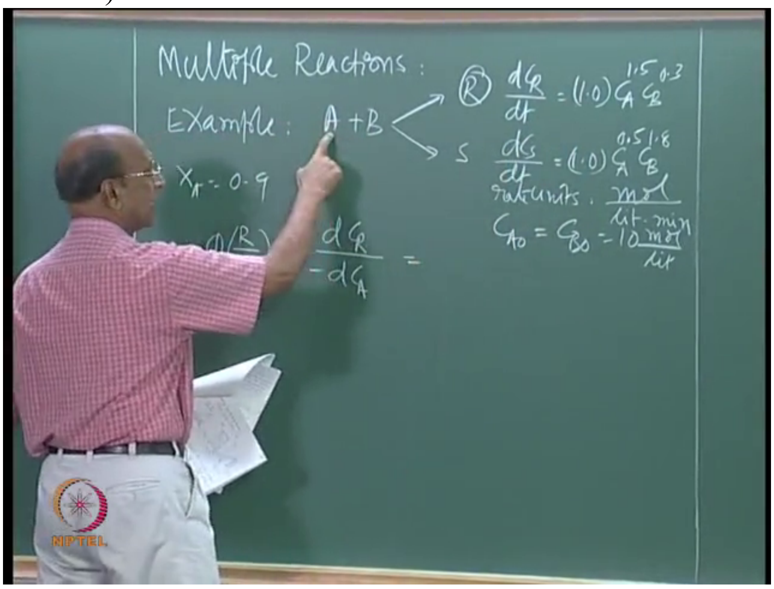

now going to R and S together so these two rates

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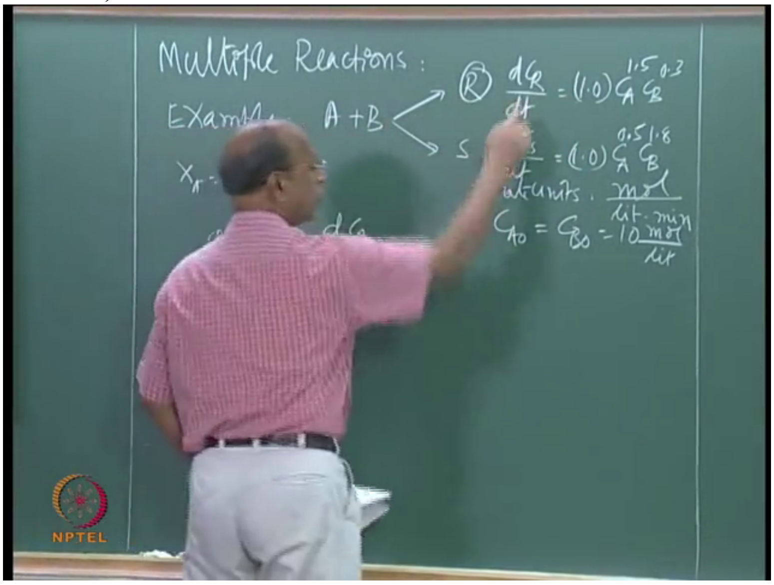

will be added, Ok anyway I think I will also write that. d C R, this is equal to d C R plus d C S

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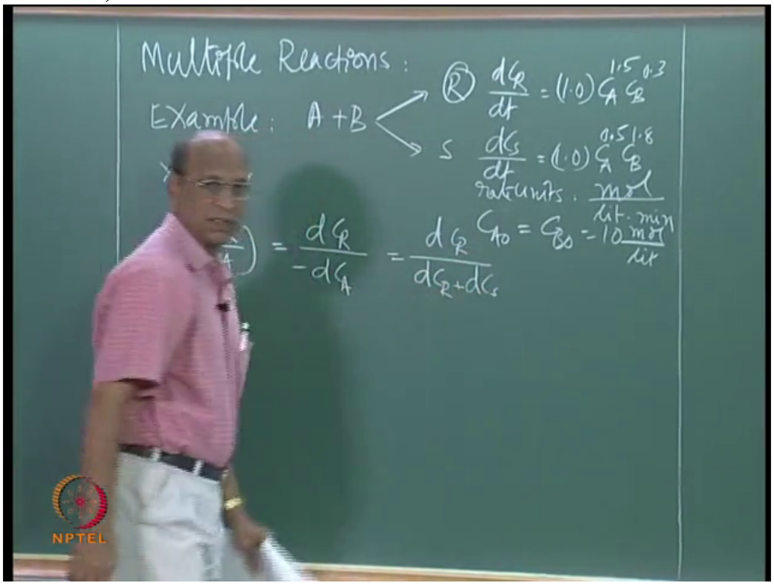

so that you know you will not get, so now this is equal to, so now I have to substitute this and then

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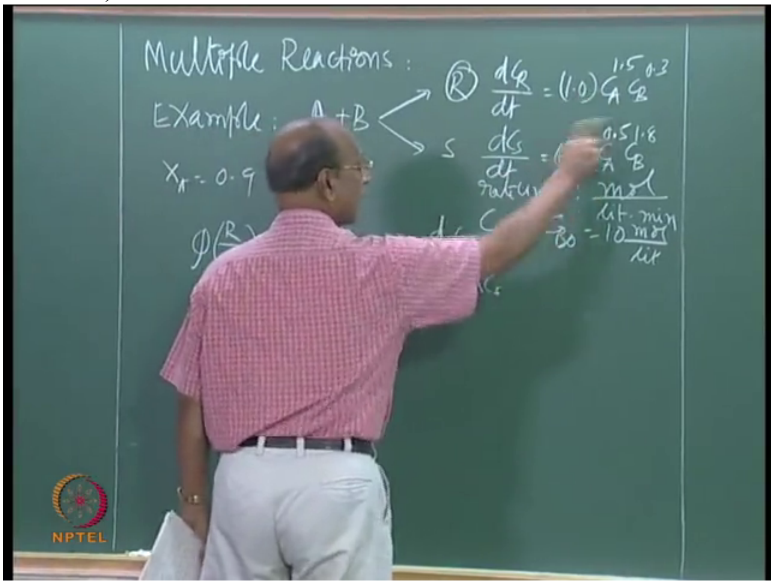

cancel out. You tell me how much this will be?

Take d C R and add these two, again take those two, and then cancel out whatever possible cancellation, select C A by C A plus C B to the power of 1 point 5. Yeah, so now let us take P F R.

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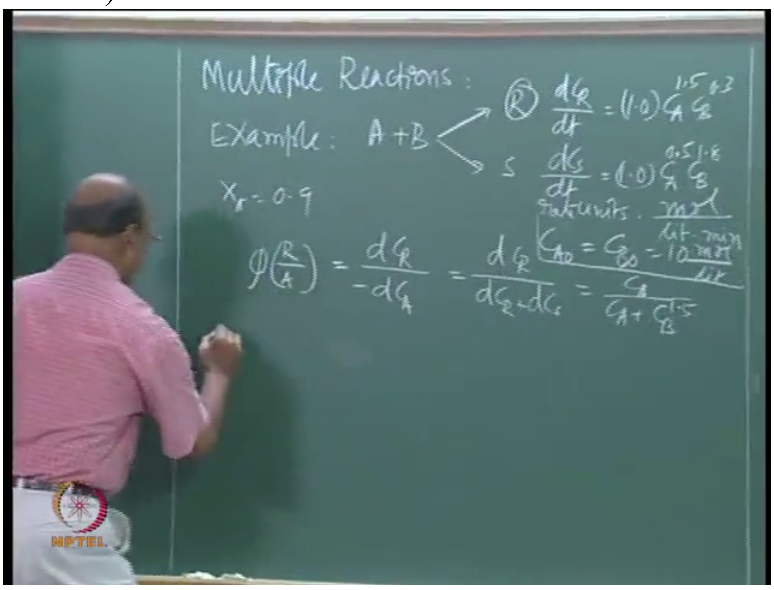

P F R what is the definition to find out C R? Integral C R f equal to integral

(Professor – student conversation starts)

Student: Phi

Professor: Yes, phi into

Student: d C A

Professor: d C A. See

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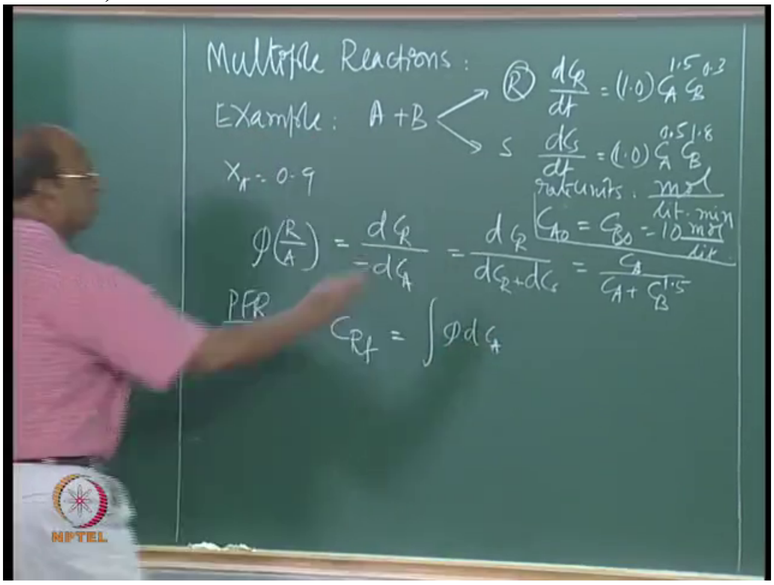

this one

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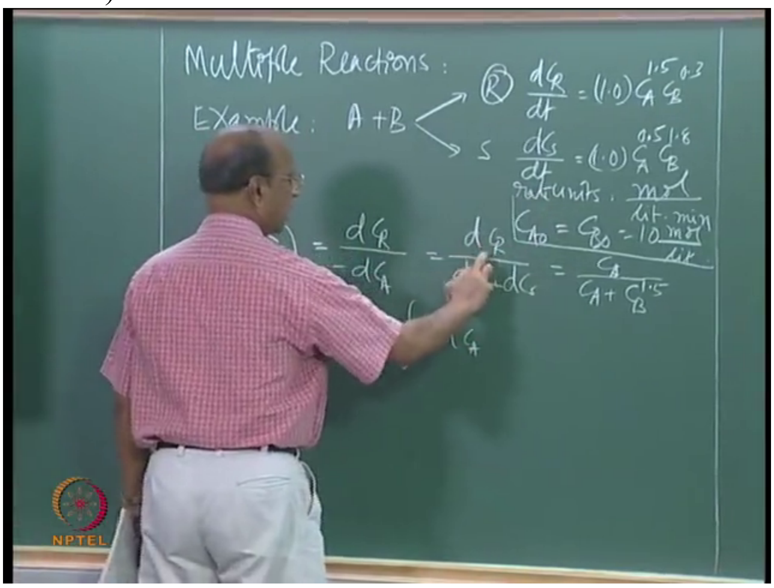

d C R I am writing d C R by d T. Then the other one is this one, d C R by d T plus d C S by, so then substitute d C R by d T

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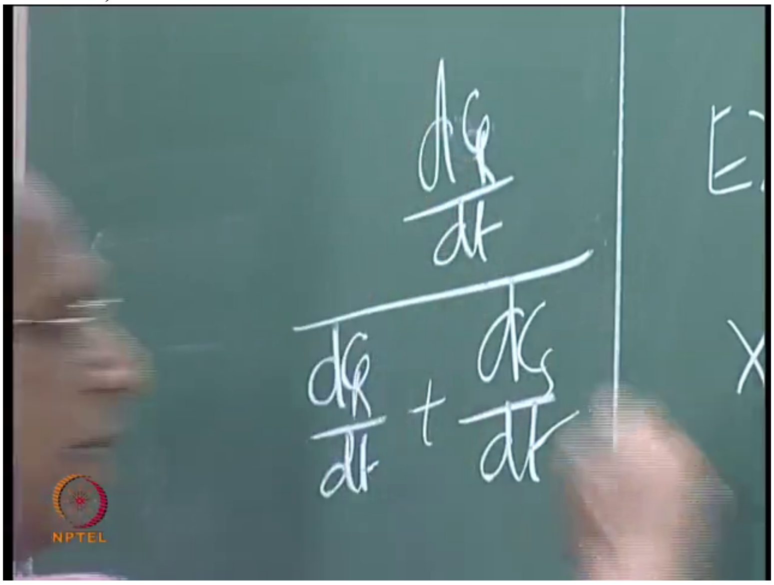

here,

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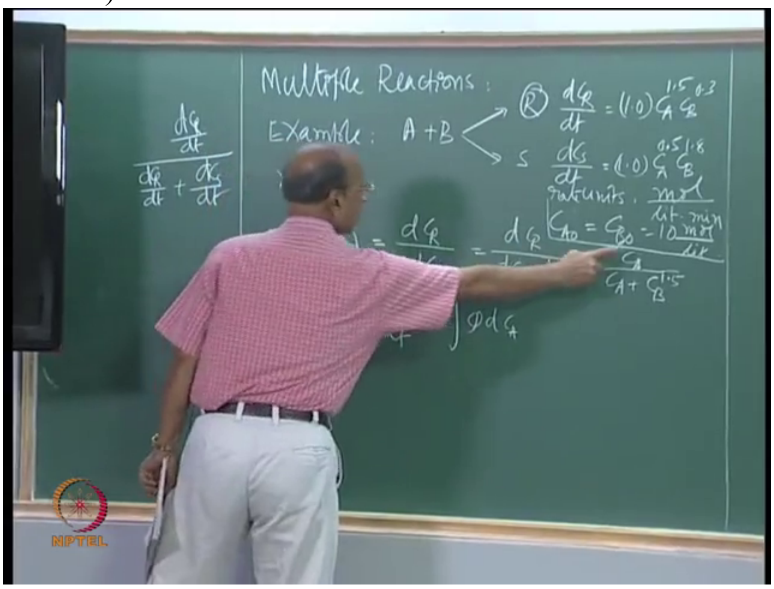

Ok and also these two added. Then you two cancel out whatever is possible.

(Professor – student conversation ends)

Because point 5 point 5 will get canceled there. Point 3 and point 3 will get canceled here that is why you get

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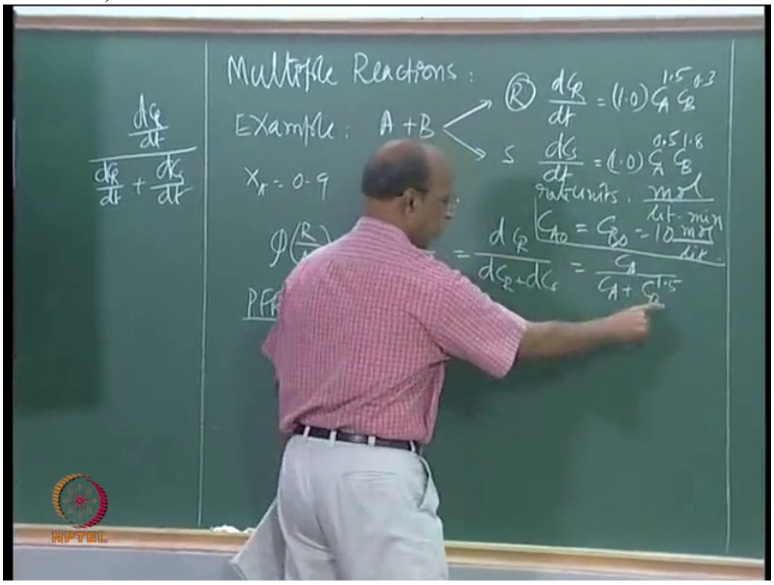

1 point 5 like that, Ok, yeah good. So now this we have to integrate between C A naught and

(Professor – student conversation starts)

Student: C A f

Professor: Yeah. Ok. So this is C A f, right so that means here

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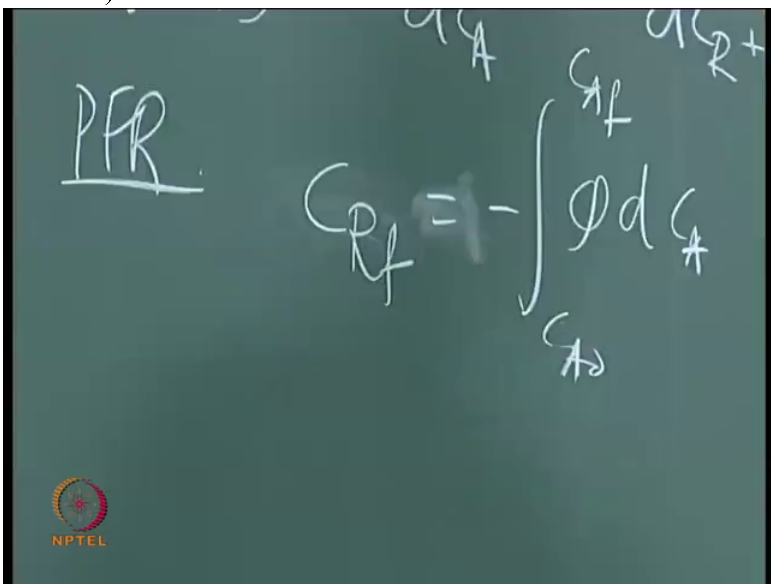

I have minus C A naught C A f, then phi value is this, this is C A, d C A by C A plus C B to the power of 1 point 5. d C A is integral and how do I

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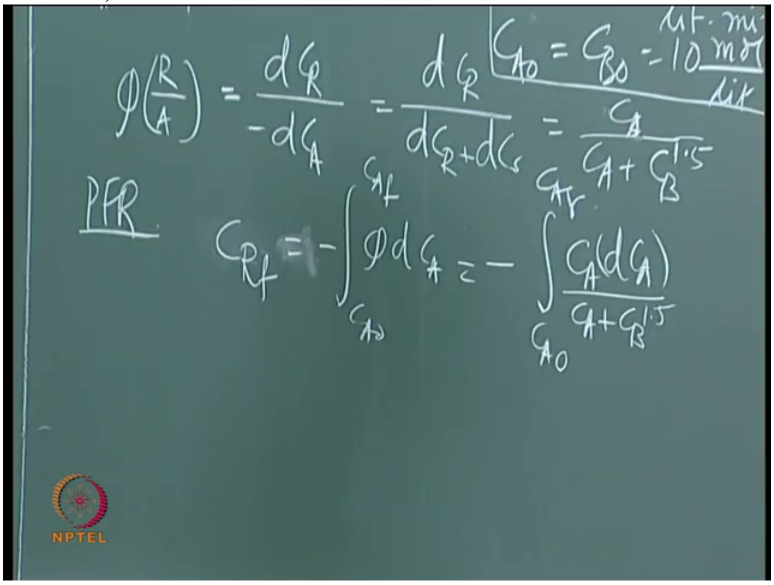

convert C B into A?

Student: Integral

Professor: Because I have to write C B in terms of C A, right.

Student: C A equal to C B

Student: C A naught minus C B

Professor: See it is 1 is to 1 and C B equal to

Student: C A

Professor: C A. Now you substitute C B equal to C A and then tell?

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Yeah initial concentrations are same, so everywhere C A equal to

Student: C B

Professor: C B. So then you can still further cancel out that. So you will have

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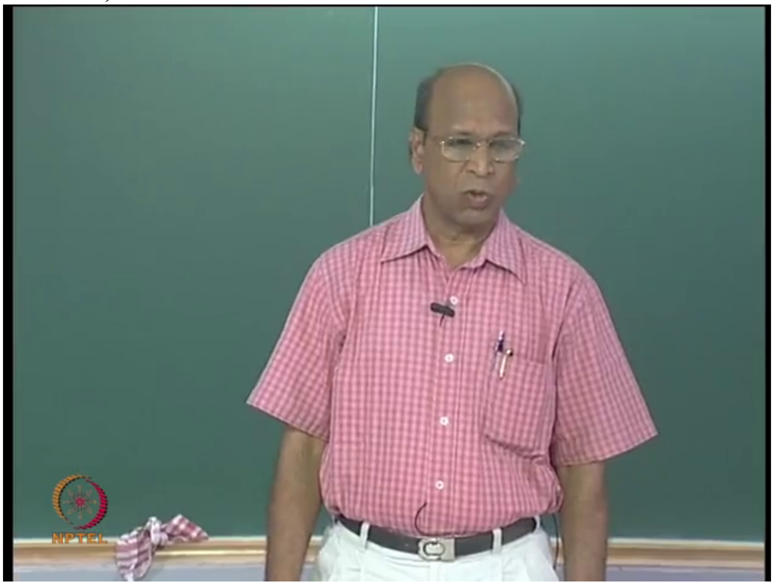

only d C A by, Ok let me also write, because otherwise many people are still sleeping I think today.

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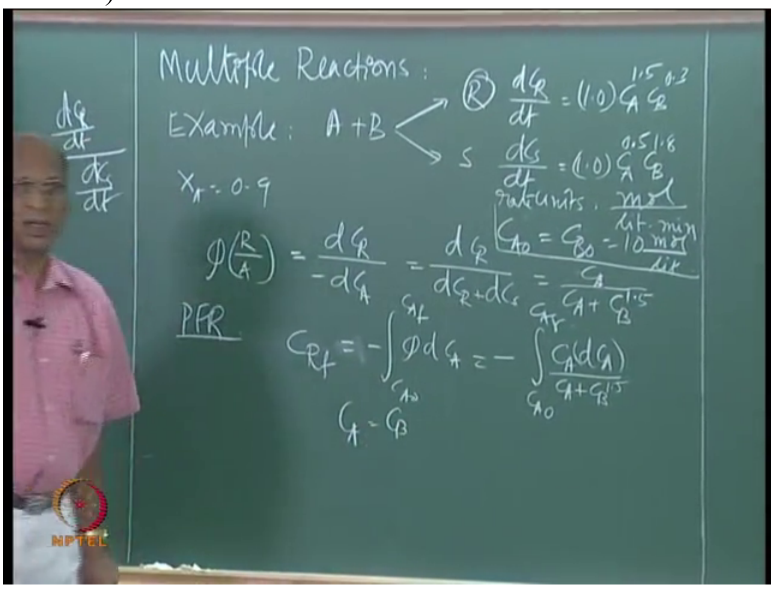

C A equal to C B everywhere. C R f equal to C A naught, C A f, d C A by 1 plus C A to the power of point 5. Now this is what you have to integrate.

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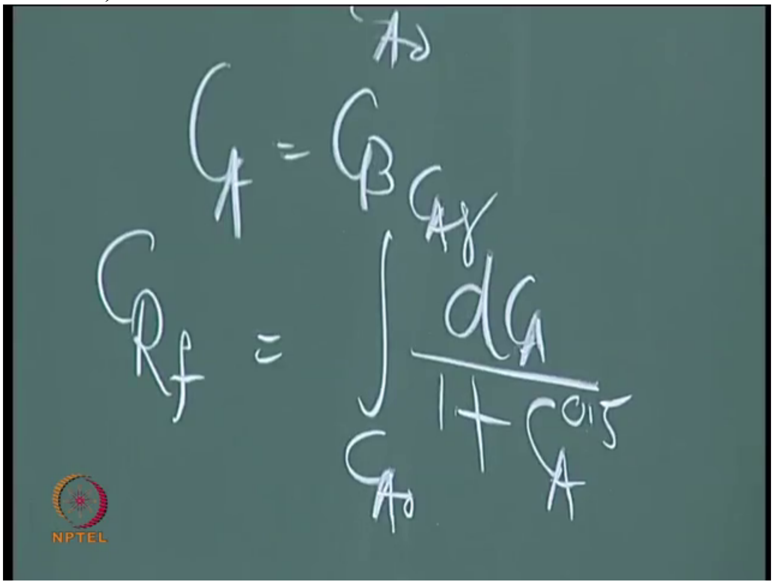

Please integrate and tell me. You do not get log book

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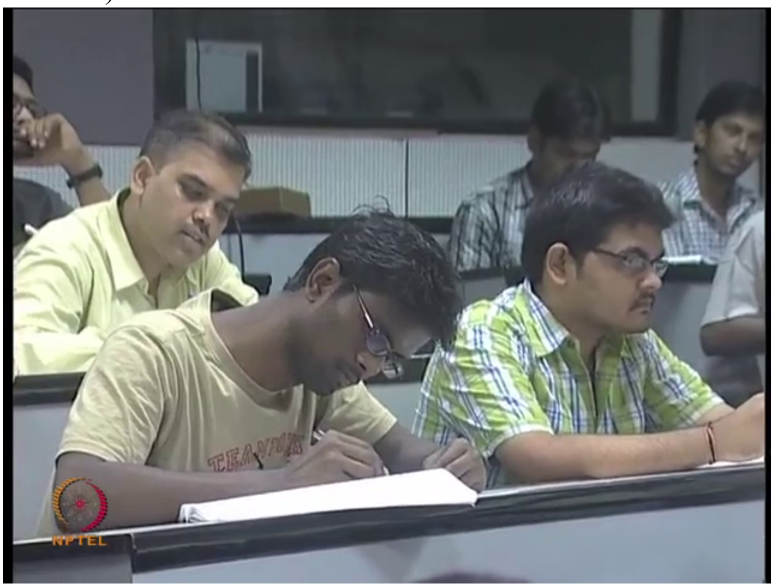

Student: Directly

Student: Using calci I can directly put

Professor: Calci,

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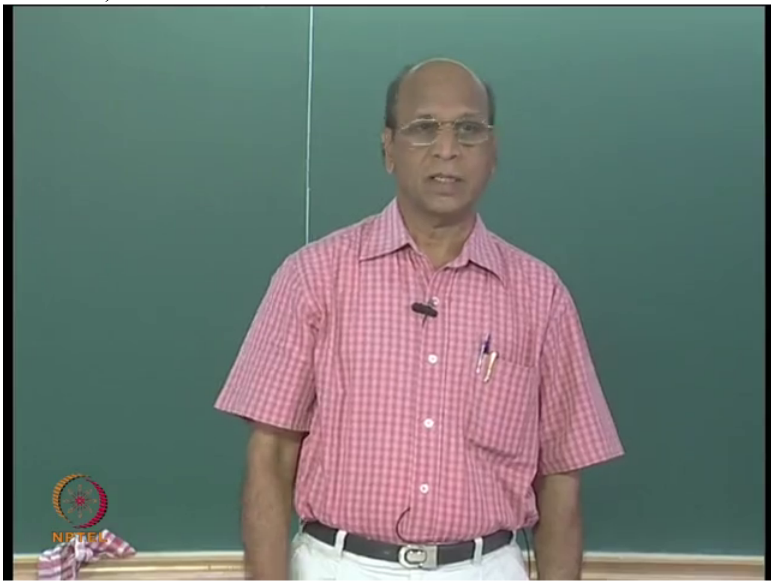

that is why 2 point 8 5. So when you use calci, I will look for exact value, Ok. Exact value is 2 point 8 6.

Student: Sir 2 point 8 5 8

Professor: (laugh) Ok, good.

Student: After integration. C A square minus l n C A square.

Professor: C A you are telling or C S?

Student: C A minus l n C A square.

Professor: Yeah, yeah that solution I do not have. But I also have the final answer.

Student: 2 point 8

Professor: 2 point 8 6 or 2 point 8 5. Ok, you please try.

Student: 2 point zero 1

Professor: 2 point

Student: 2 point zero 1. How much you are getting?

Professor: 2 point zero 1, 2 point 8 6. 2 point 8 6 moles per liter. What is that

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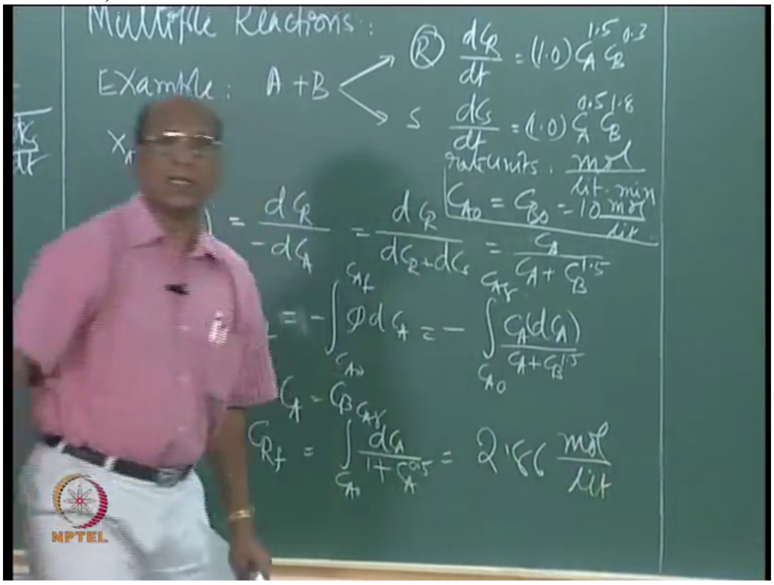

Student: 8 5 8

Professor: No problem. I think 8 6, good. I think the simplest one now you can try M F R. You do not have to integrate. I think you know, whenever there is integration or differentiation, you are not comfortable.

Student: Yeah.

Professor: Yeah, for M F R? So phi also equal to phi M, total you know capital

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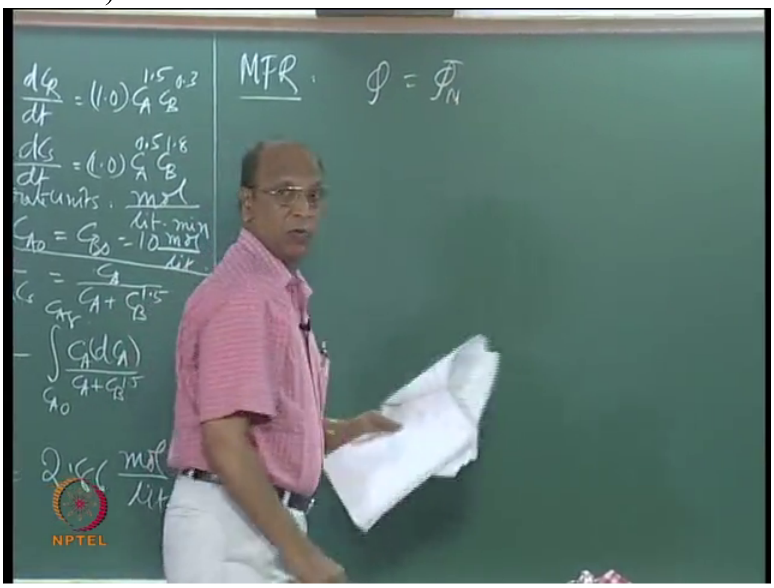

phi M, what is the value? 1 by 1 plus C A to the power of point 5. How much is this? C A equal to how much? 1 Why 1?

Student: 90 percent conversion.

Professor: 90 percent conversion, excellent, 90 percent conversion. So that is why 1. So what is the value?

Student: Point 5.

Professor: Point 5. That is phi but what is

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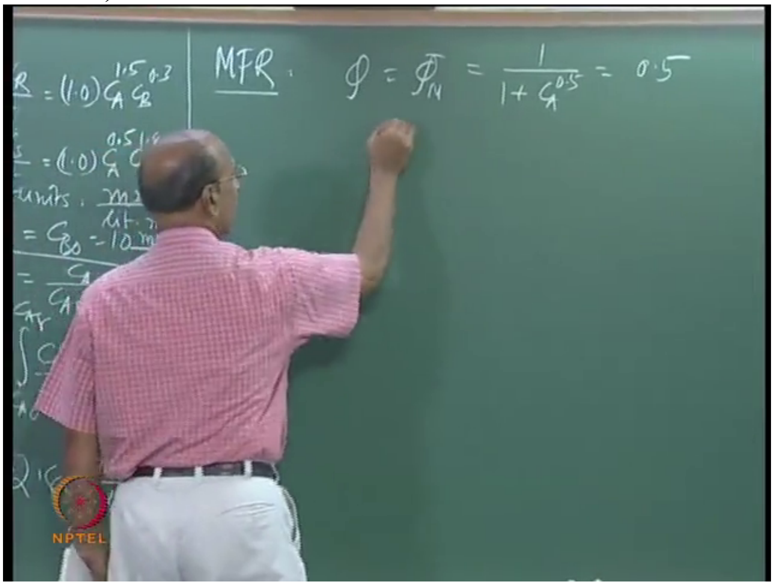

C R F?

Student: Point naught 8

Student: Phi into C A naught minus C A f

Professor: Yeah so that is point 5 into

Student: 9

Professor: 9 excellent.

Student: 4 point 5

Professor: 4 point 5 moles per liter. Good.

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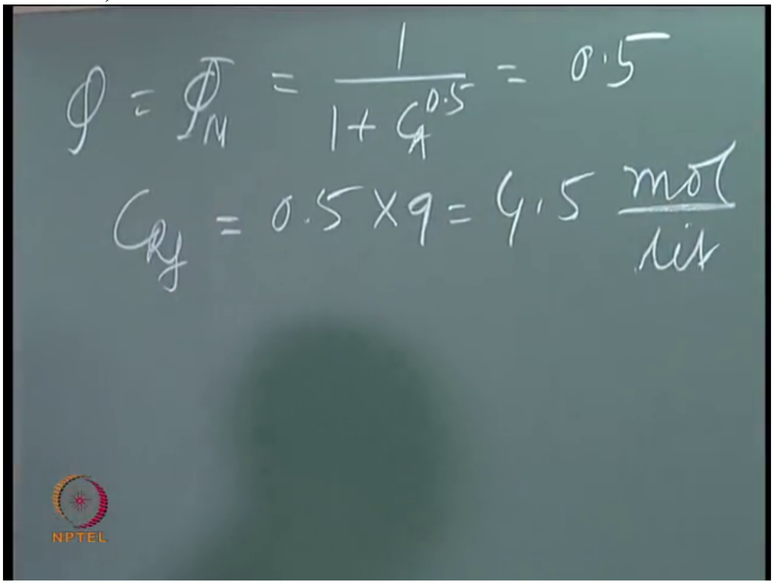

(Professor – student conversation ends)

You can also draw this graphically and also try to find out, right? Because I have an equation for phi. This is the equation,

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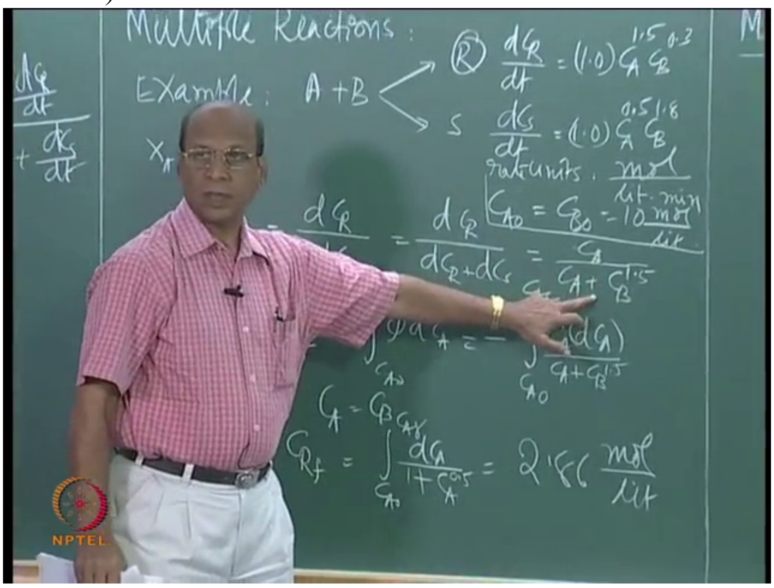

right. So actually after substituting C A equal to C B everywhere then this will be 1 by, 1 by 1 plus

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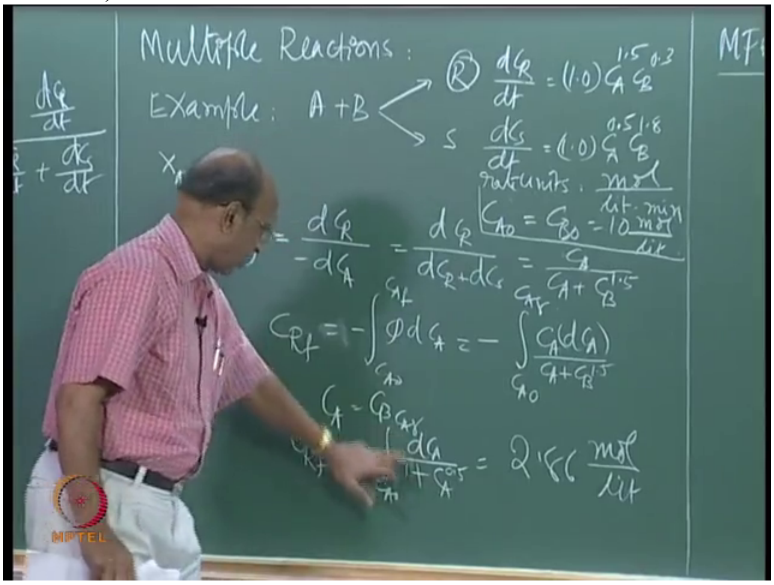

C A to the power of point 5 that you plot graphically. Phi equal to 1 by 1 plus... this versus C A. How do I get this?

(Professor – student conversation starts)

Student: 0:09:30.8

Professor: Increasing or decreasing or what?

Student: By decreasing

Student: C A

Professor: Very good. It may decrease something like this. May be hydro, yeah. Right? Because C A initially very large,

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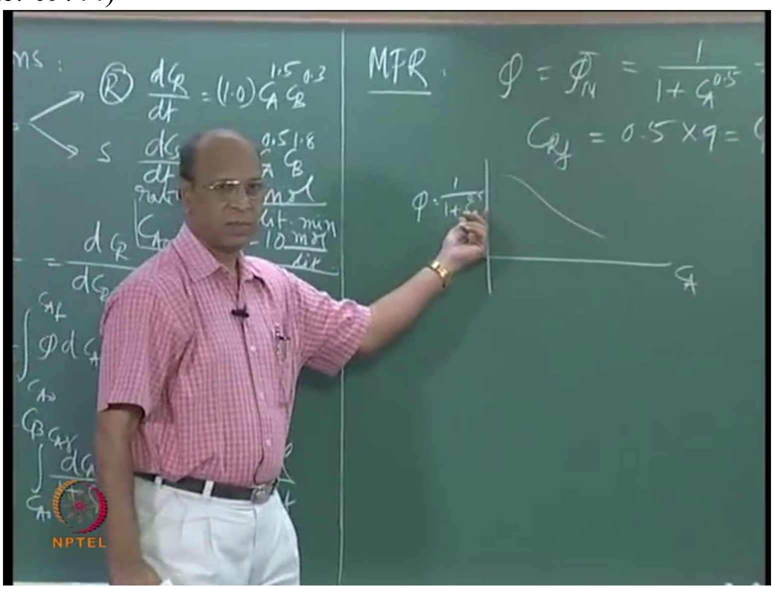

right?

Student: Yes

Professor: For example C A equal to 10, then when you are moving this side, this is decreasing, phi increases no?

Student: 1 by 1 plus something always decreases.

Professor: Yeah, anyway I am just giving explanation because we are moving in this direction, right? Ok. So then you know that you have C A naught equal to 10 here,

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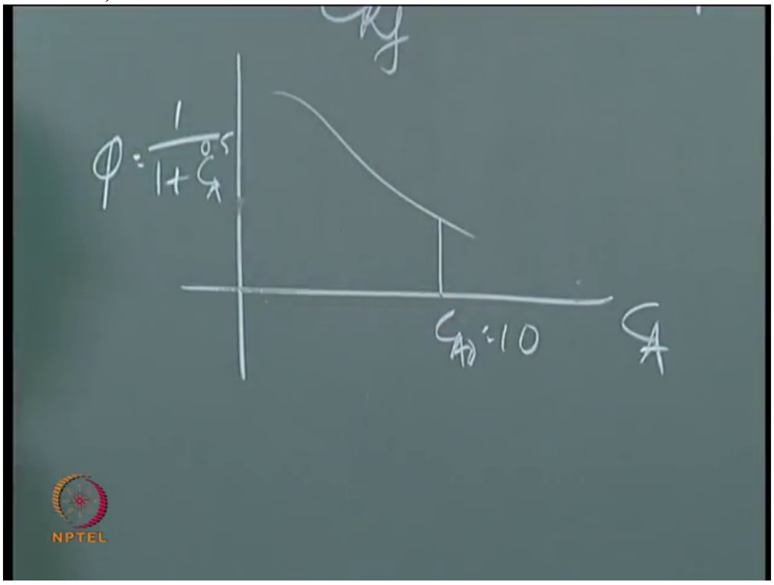

right and this is 9, C A equal to 9

Student: 1

Professor: Yeah, C A equal to 1,

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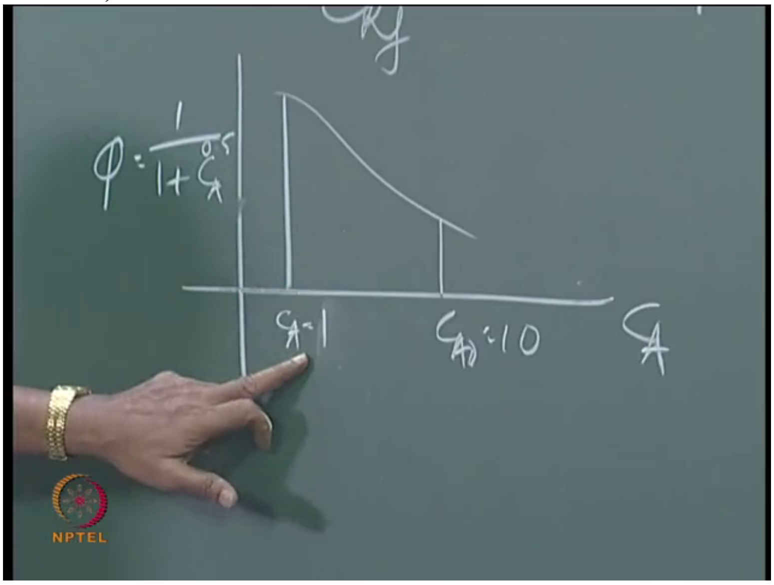

so then what is happening, which reactor will give you the best yield?

Student: M F R

Student: Yeah, M F R

Professor: Again you are getting confused.

Student: P F R

Student: M F R

Student: Minimization

Professor: Yeah, it is not minimization; we have to maximize the area because we are talking about C R f, right? So for M F R, all these. M F R

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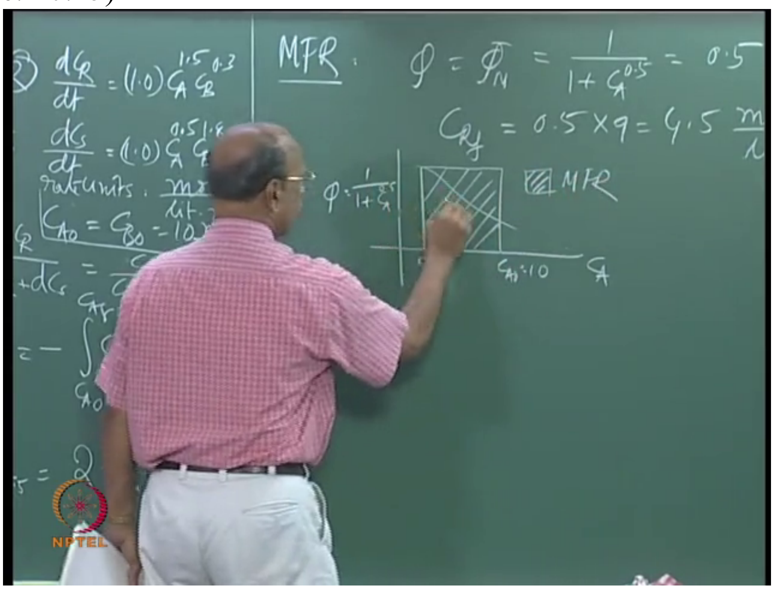

and this one only, for P F R,

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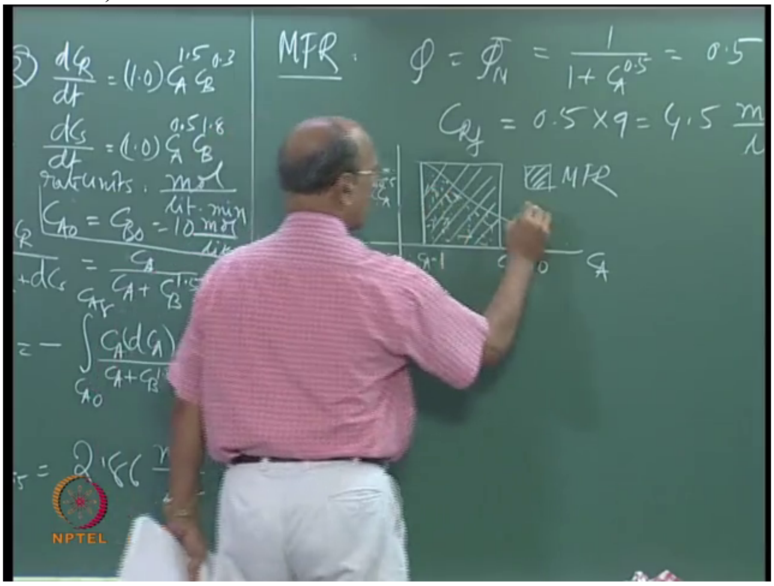

yeah. Ok.

(Professor – student conversation ends)

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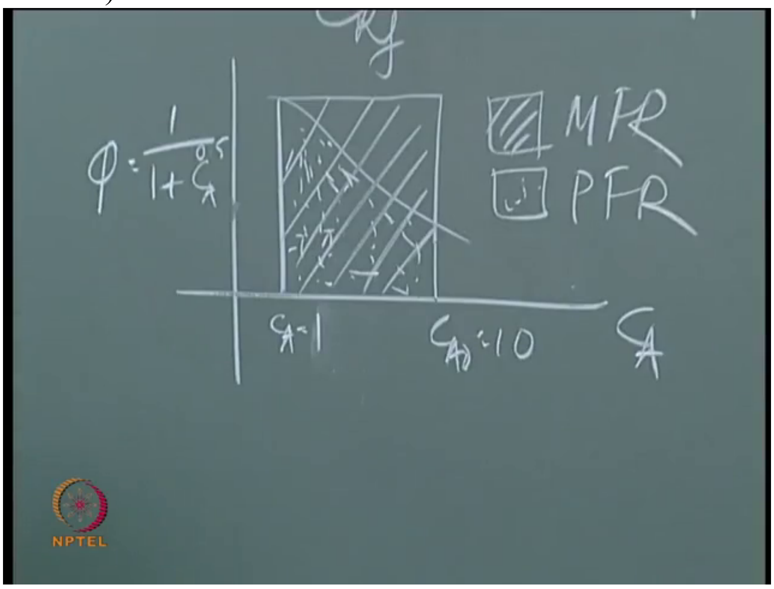

So actually that is also, will be very easy if you are able to plot but that means no, you must be artistic in drawing the graphs and all that. I just want to again point out, I do not know, you would have just simply solved the problem, you would have got 2 point 8 6 and also 4 point 5 you could have closed your mind. But beyond that you have to think.

In this case why are you getting in a mixed flow reactor more conversion than yield?

(Professor – student conversation starts)

Student: The orders

Professor: Which order you are talking?

Student: Of the C R, C R and that ratio

Professor: Which is more?

Student: Overall ratio for

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C S is less compared to C R that is why

Professor: C S is less, order? See what is our rule? What is our rule in terms of concentration?

Student: You have to keep concentration as high as possible.

Professor: When? When do you want to keep?

Student: When order...

Professor: When the order of desired reaction

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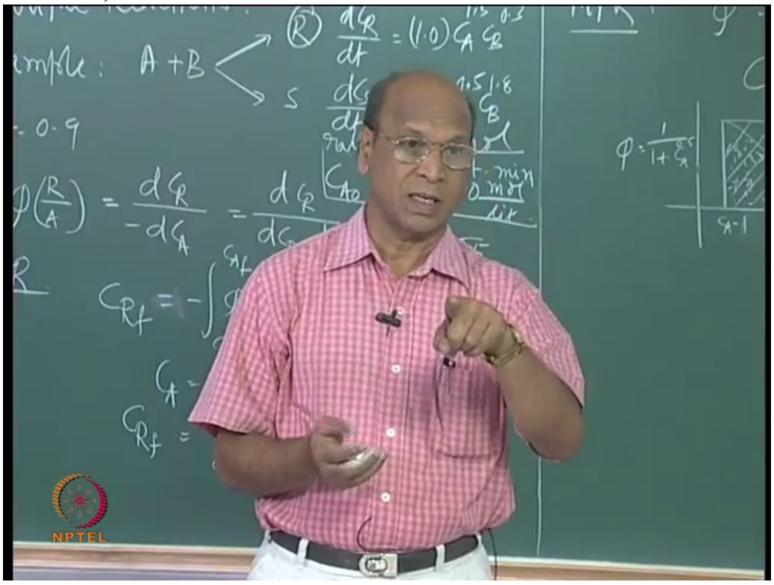

Student: Is less

Professor: is more

Student: More.

Professor: Order of desired reaction, Ok. But here it is more or less? It is less because it is 1 point 8 and this is,

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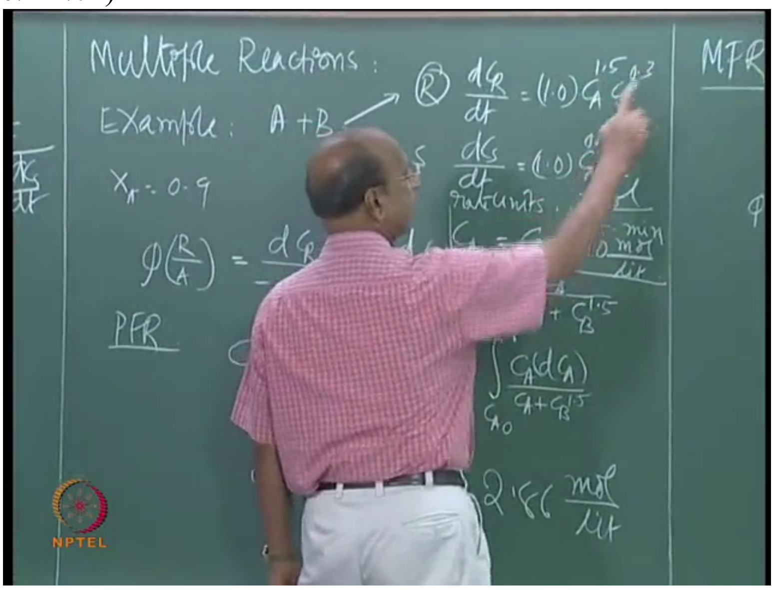

overall, overall if you take, this is 1 point 8, this is 2 point 3. That is the reason. That is the reason, that small difference, Ok. You know that is what. When you are solving, after solving, after getting the value, we have to also think a little bit no, why I am getting this. Yeah, you tell me now.

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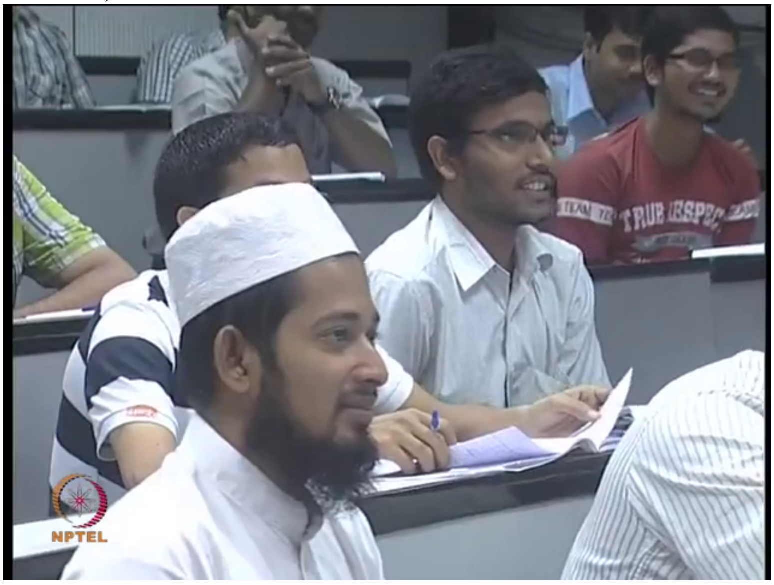

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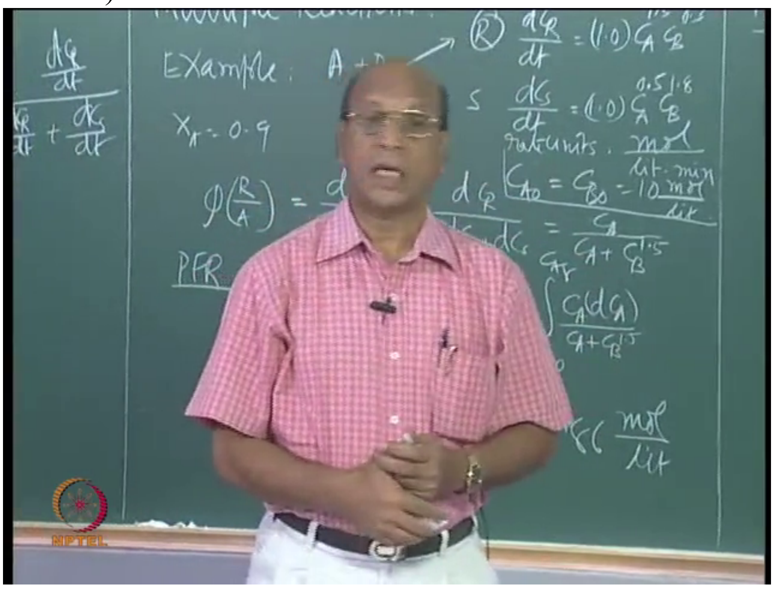

reaction order so that is the reason you get here in M F R more value than P F R, excellent, very good. So now on your own, there are many problems in Levenspiel various nice, beautiful problems. You have to solve, solve, solve. I can give anything in that. Also a surprise test in the final test, you know next week.

Student: Sir we check individually about the reactants A and B concentration? With respect to A, C A is d C A by d C S

Professor: Yeah

Student: And with respect to B, minus 1 point 5.

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So B should be as low as possible and A should be as high as possible...

Professor: No, no, no. What is that you are talking? You have to take the overall

Student: With respect to A and with respect to B if we check?

Professor: No, but what is the use? Because both the, A and B both are participating in the reaction

Student: d C R by d C S I am saying

Professor: d C R by

Student: d C S

Professor: Yeah, but that is, you know you are talking now not yield, you are talking about selectivity. No, we are talking about, directly we are

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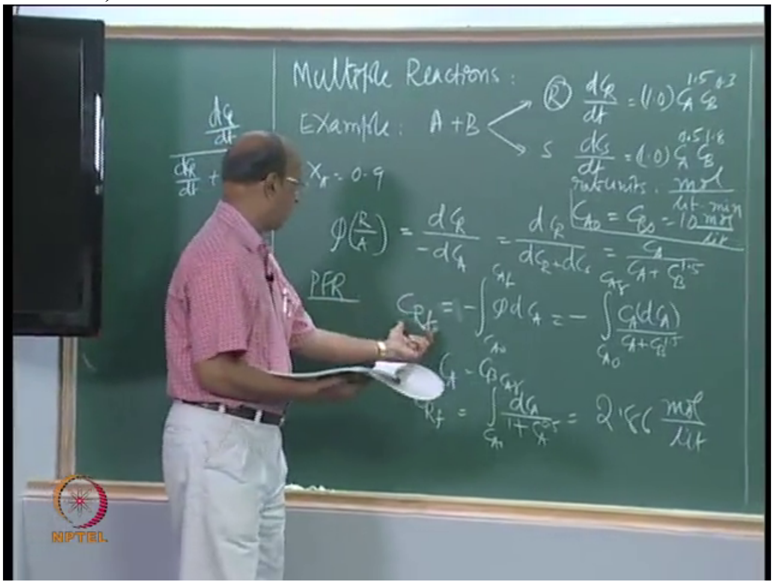

trying to get this one no, desired product itself, Ok. So he is now trying to write the other one, selectivity. But even then you should get the same argument. You cannot get different argument for that.

Student: d C A should be as low as possible, for maximization of R.

Professor: Not A again, you should write d C R by d C S, Ok, yeah.

Student: Correct, I think

Professor: d C R by d C S is not yield for us.

Student: He is talking about selectivity

Professor: It is not; yeah it is selectivity, Ok. Yeah, so now what is the argument? If d C R by d C S is, and you should keep that value low or high? As high as possible? Yeah.

Student: As high as possible and C B should be as low

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as possible

Professor: Yeah, right

Student: For that

Professor: For that different

Student: P F R with distributed

Student: Parallel, side streams

Student: Side streams

Professor: Yeah, A is as high as possible.

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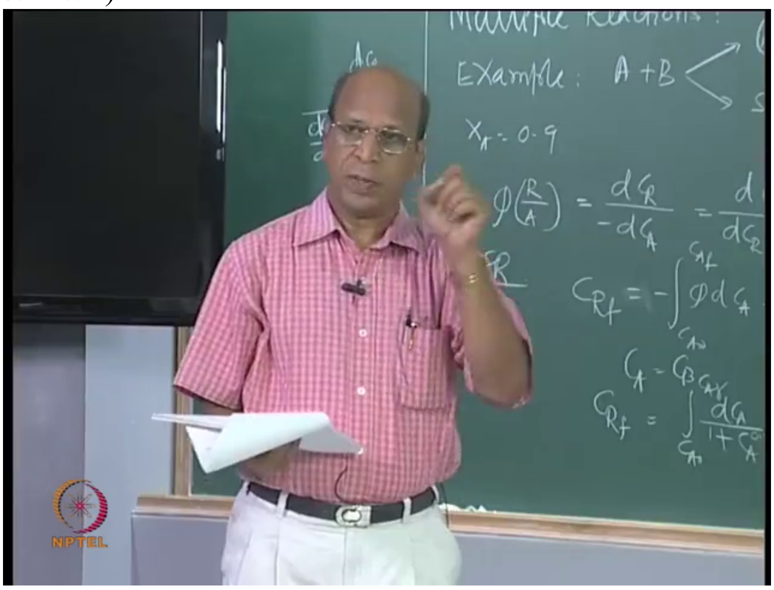

B is as low as possible. Then you have side streams or you have another alternative, mixed flow reactors with side streams, Ok. So that is one.

(Professor – student conversation ends)

I think you know here you will have many, many alternatives. I think this, many people will not touch this multiple reactions but there are many, many things here. Particularly when you go to that van der Vusse reaction and also Denbigh reaction, you will have lot of conflicts, Ok, but still our basic rules are same. When the desired rate is more, Ok, for particular desired product then you have to maintain concentration as high as possible. Or undesired product if you want to keep as low as possible, if that rate is low.

(Professor – student conversation starts)

Student: The reaction should not take place

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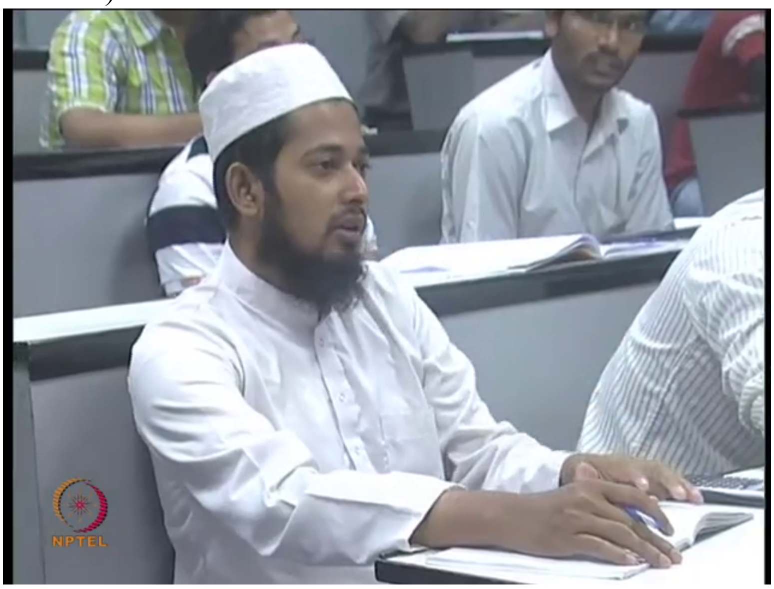

at all.

Professor: As low, as low...

Student: Which they should be balanced

Professor: As low, means you should not put zero I say

Student: Which should be balanced

Professor: Reaction should happen, Ok yeah, but you have to only distribute that the concentration such that you know you have

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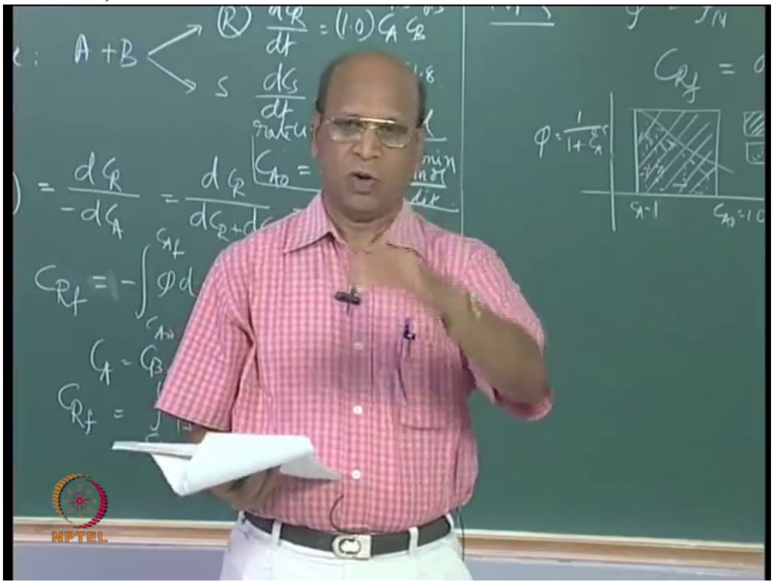

low, whatever is required, either A is low or B is low depending on the situation, lower than C A, yeah. So this is very nice.

(Professor – student conversation ends)

Now we have not talked anything about volume of the reactor till now. We are only talking about C R f. But none of you asked how do you calculate tau or I also did not tell. I was being mentioning this all the time. Now I would like to get what is the value for the volume, numerical value for this kind of multiple reactions, how do you do that?

Like same, I have, yeah I am just only restressing the same things but let me take parallel reactions. We are talking about only parallel reactions all the time. Of scheme A going to R and A going to S, Ok. So here I have k 1, k 2. As usual epsilon equal to zero, right?

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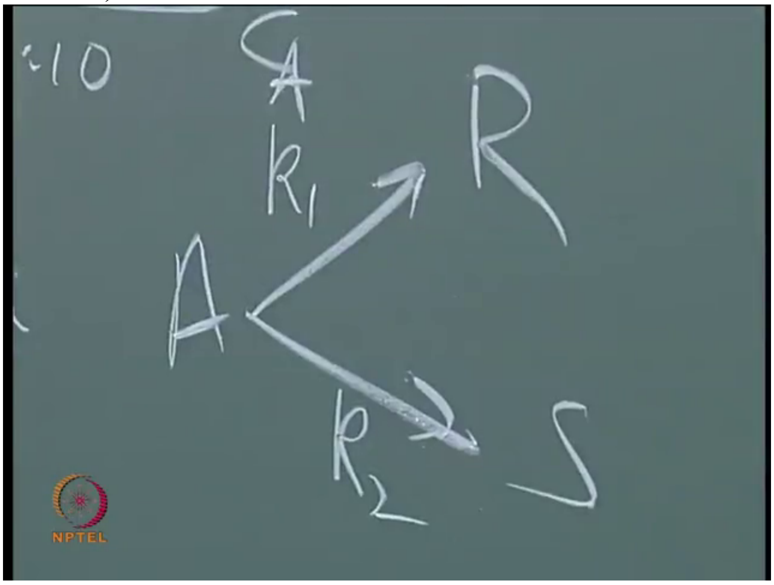

How do you get an equation for plug flow from this? Yeah, rate may be, simply this is, yeah d C R by d t equal to k 1 C A. d C S by d t equal to k 2 C A

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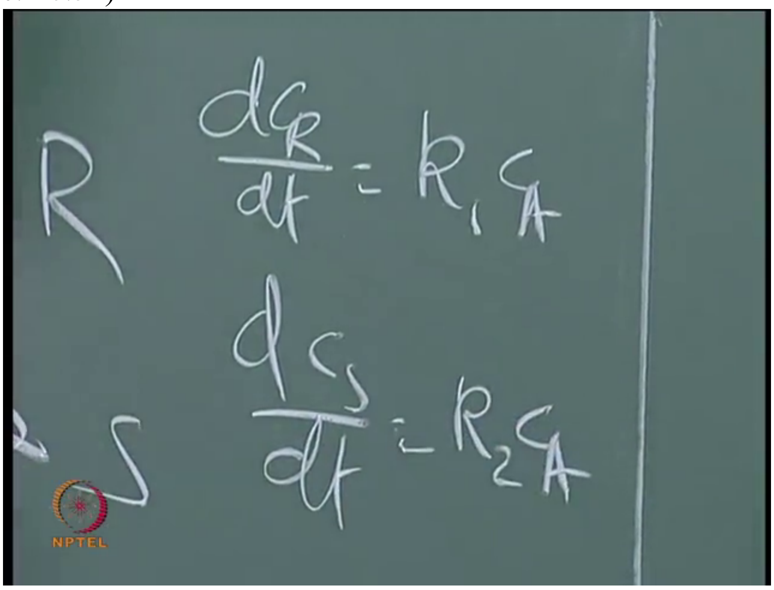

and minus r A equal to k 1 plus

(Professor – student conversation starts)

Student: k 2 C A

Professor: k 2 C A.

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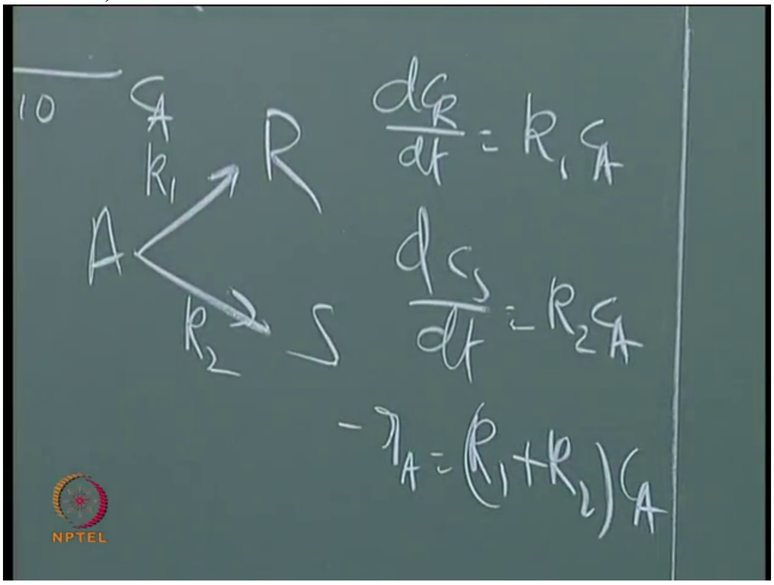

Ok, good. Now for P F R how do I get an equation in terms of volume? Either tau or V by F A naught?

Student: Same

Professor: Same means what, you tell me

Student: k is replaced k 1 plus k 2.

Professor: What is the equation? I am asking final P F R equation.

Student: V by F A naught is equal to

Professor: Yes, V by

Student: F A naught is equal to

Student: k 1 plus k 2

Student: 0:17:31.0

Professor: Now tell me the equation

Student: k 1 plus k 2

Student: into C A

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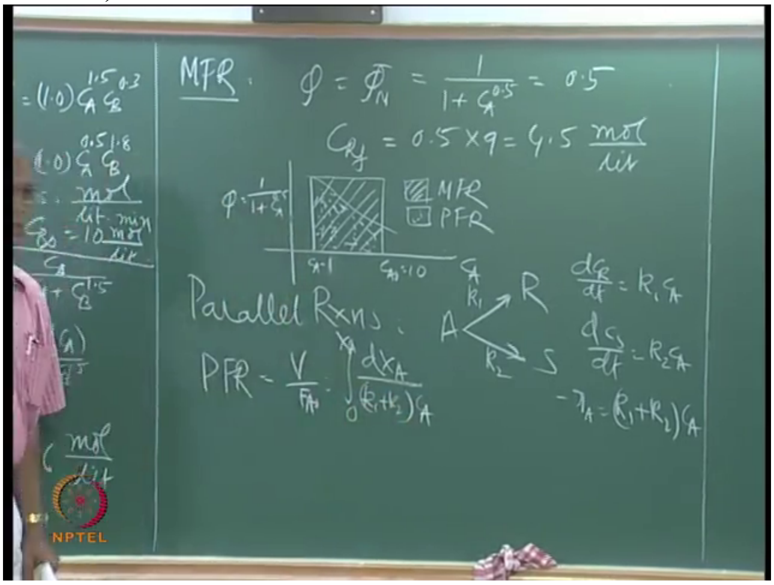

Professor: And now integrate and tell me.

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V by F A naught equal to minus

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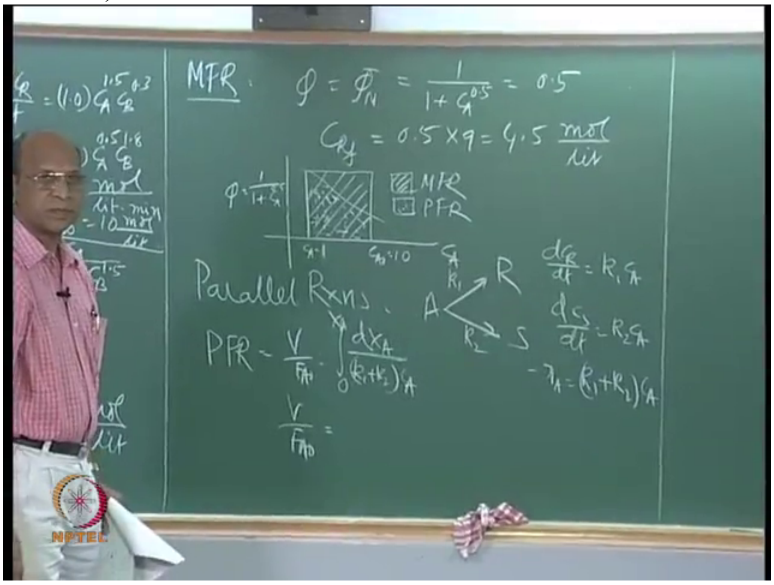

Student: Sir, V by F A naught is equal to minus l n 1 minus X A

Professor: 1 minus?

Student: X A upon k 1 plus k 2 C A naught, divided by k 2 C A naught

Student: C A naught

Student: C A naught

Professor: This entire thing?

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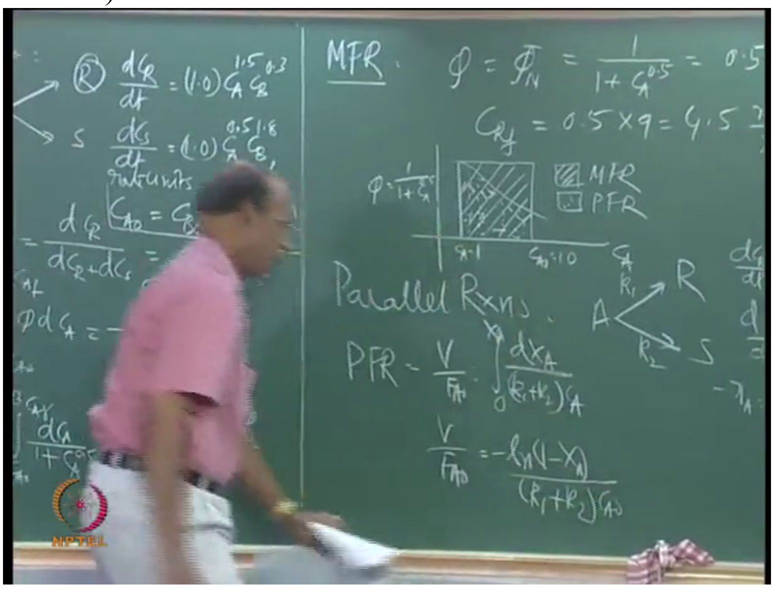

Student: When you express it in terms of C A, you should have minus d C A by

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Student: But I am expressing in terms of X A

Professor: What is wrong? I have written here d X A by minus r A.

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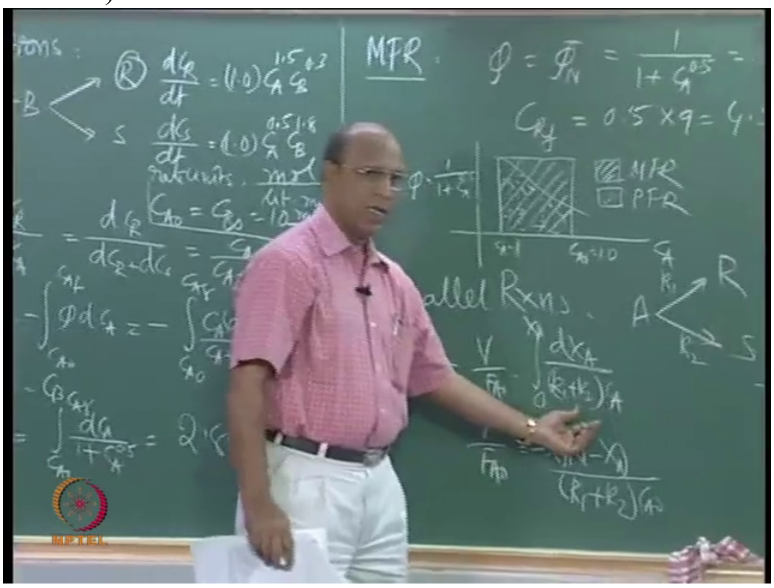

I have written this in terms of C A; you convert that in terms of X A.

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Then only we have to integrate. Otherwise write the equation in terms of C A and then again integrate whatever.

(Professor – student conversation ends)

So if I write also the same thing in terms of e power minus k 1 plus k 2 tau, because it is constant density system we can write happily.

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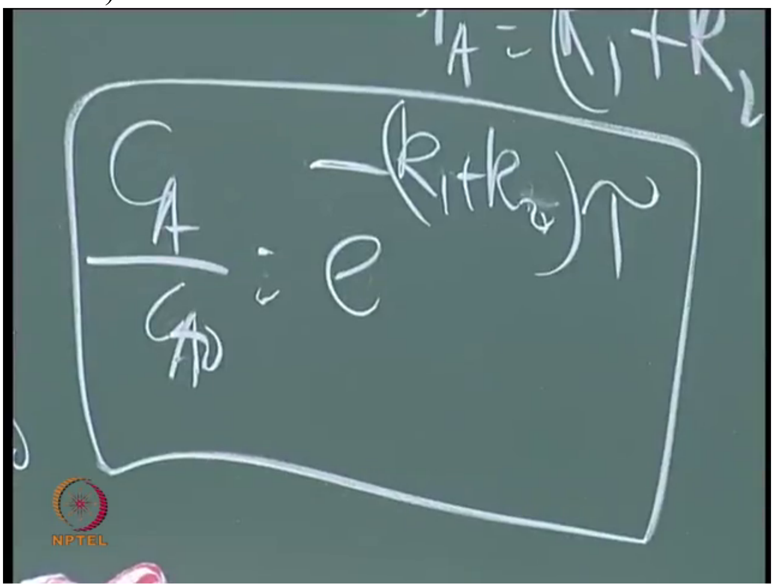

Ok so that is the equation where you can calculate either volume or this one.

And we can also do the same thing in terms

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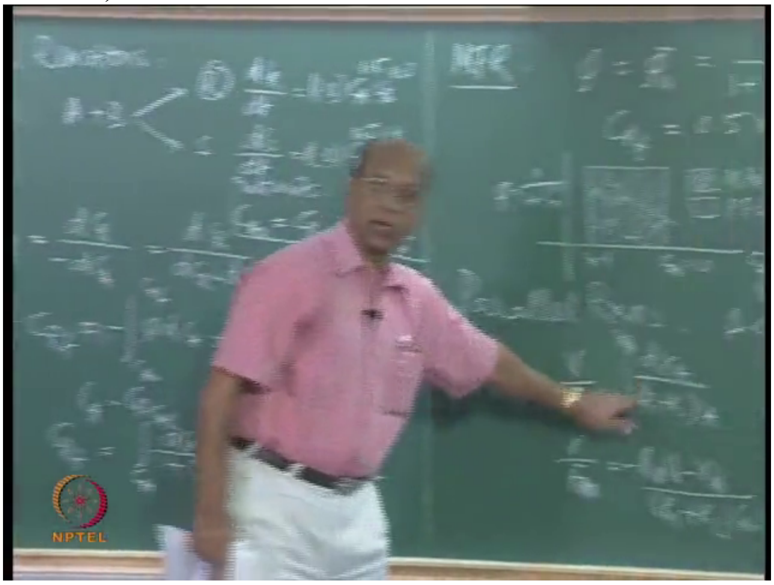

of C R, in terms of R also. This one I have not done till now. I think I have to do at least once. Always we have been writing in terms of only reactants, Ok. Let us write this in terms of products where this is again plug flow reactor, where we have the same reaction we are talking.

Even this, even this equation you got only by material balance, right?

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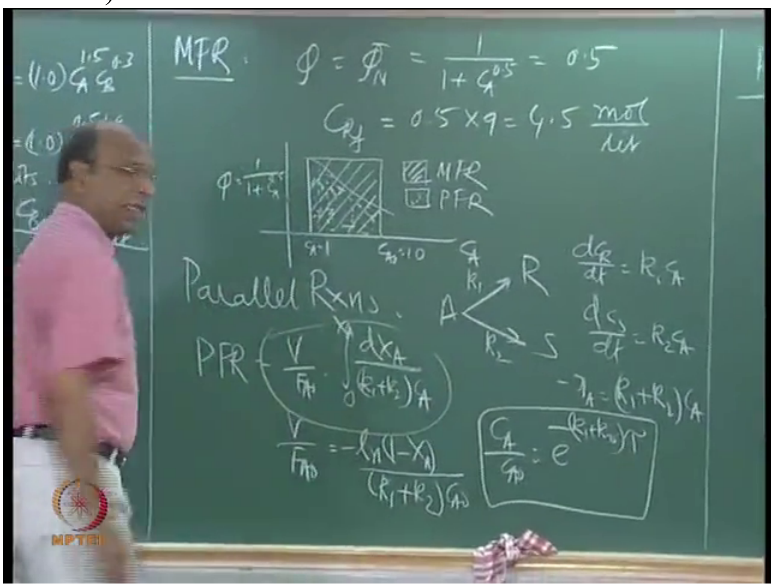

You take the volume and then what is entering, what is leaving, what is reaction under steady state conditions all that, so we will write here, yeah F R entering, we are writing now for product. One of the products, right.

Yeah F R because, yeah this is the same reaction, let me also have here A going to R, S only, so this is F R d F R so tell me what is entering, what is leaving?

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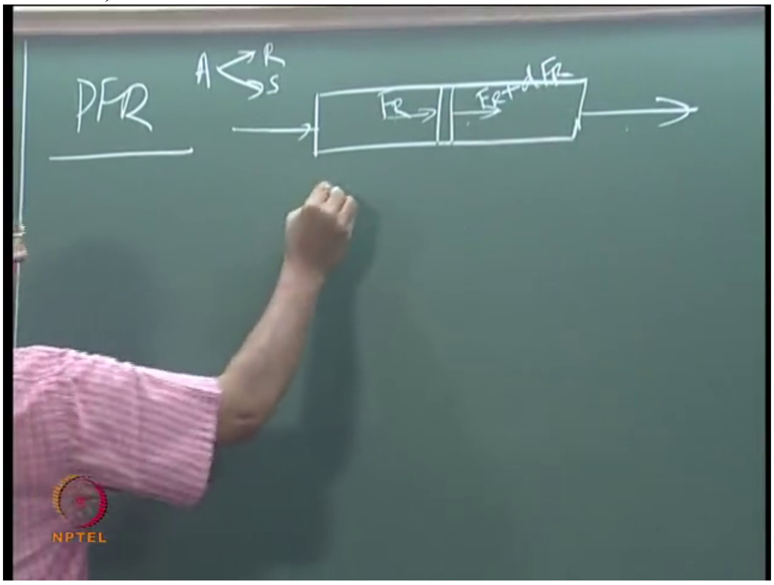

F R is entering

(Professor – student conversation starts)

Student: F R plus d F R is leaving.

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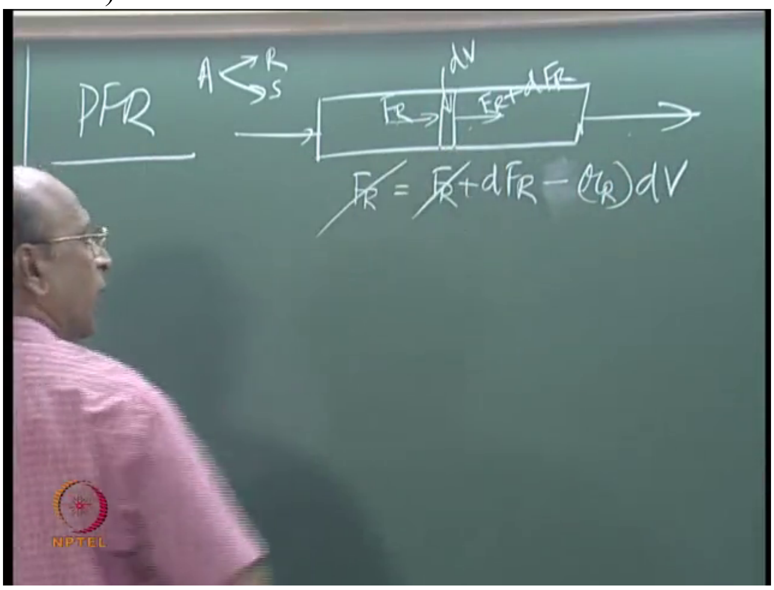

Professor: F R plus d F R is leaving, plus what is reaction term?

Student: Minus r A into A.

Professor: Yeah, it is not plus here because we are now writing for product, yeah so minus r R into d V, this is V. So F R, F R will get, get cancelled. So d F R equal to d V, r R into d V,

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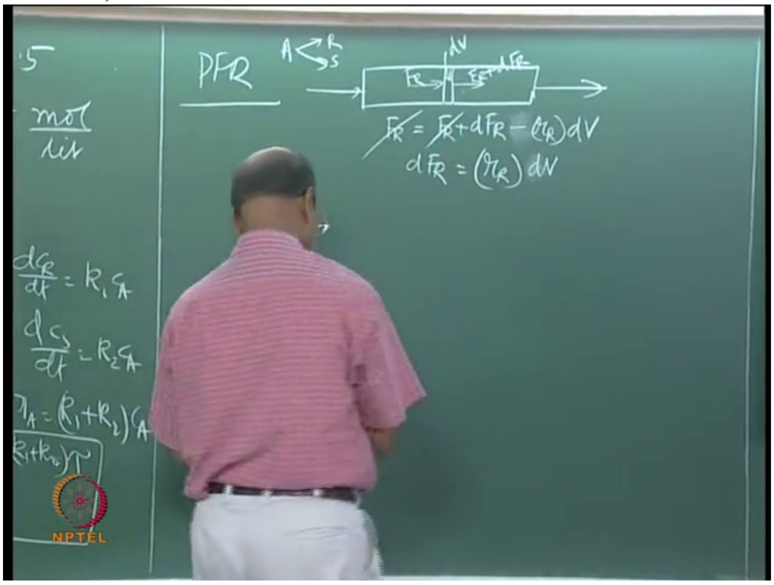

yeah so now this also I can convert in terms of our usual expression because F R, yeah F R also can be written as v into C R, you know volumetric flow rate and concentration, correct no? Yeah.
(Professor – student conversation ends)

So now differentiate this. d F R equal to, we are applying this one for constant density system that is why V is constant throughout. Ok. Otherwise that also becomes

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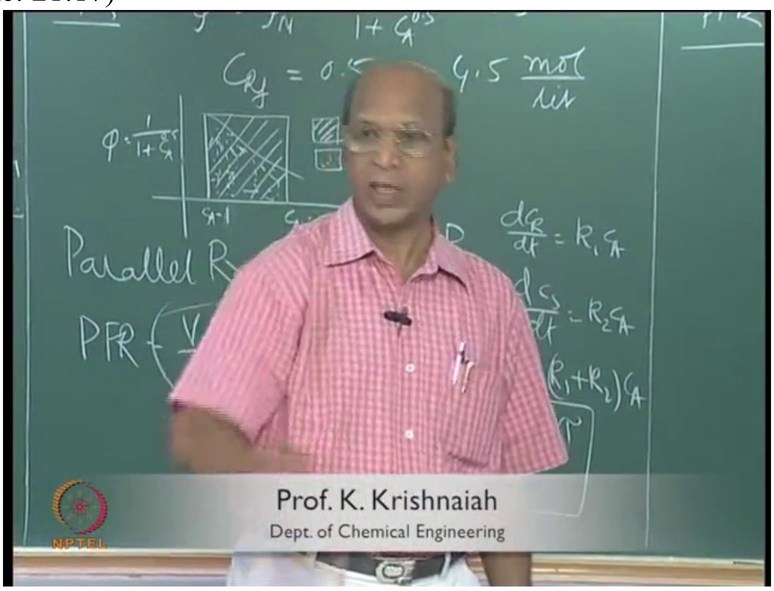

d V, C R into d V plus V into d C R, Ok but that is not, I mean that is slightly more complicated. So this is what we are taking.

Now I have to substitute this here

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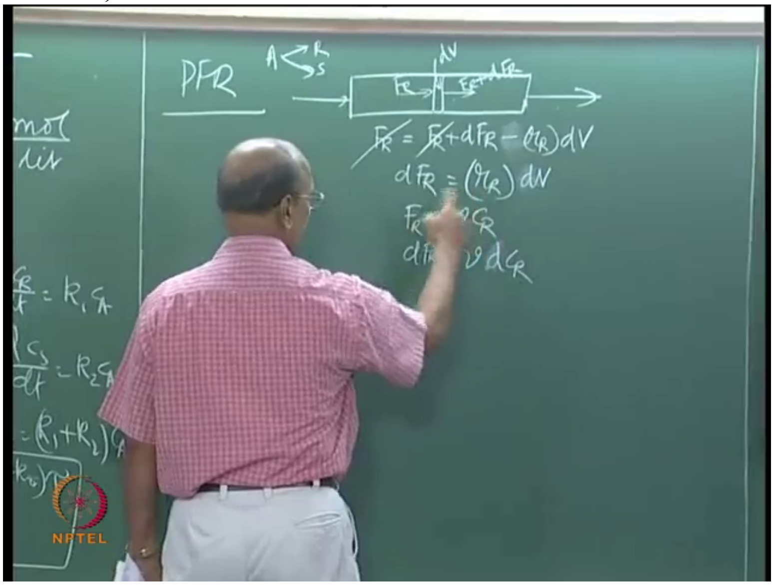

for d F R. So V d C R equal to r R d V

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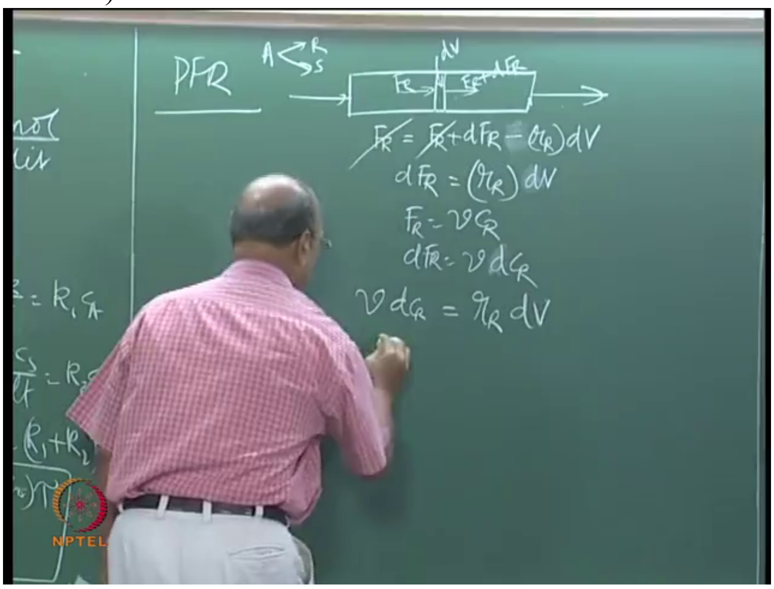

so I will write here d V by V equal to d C R by r R so when I will integrate this, this will be

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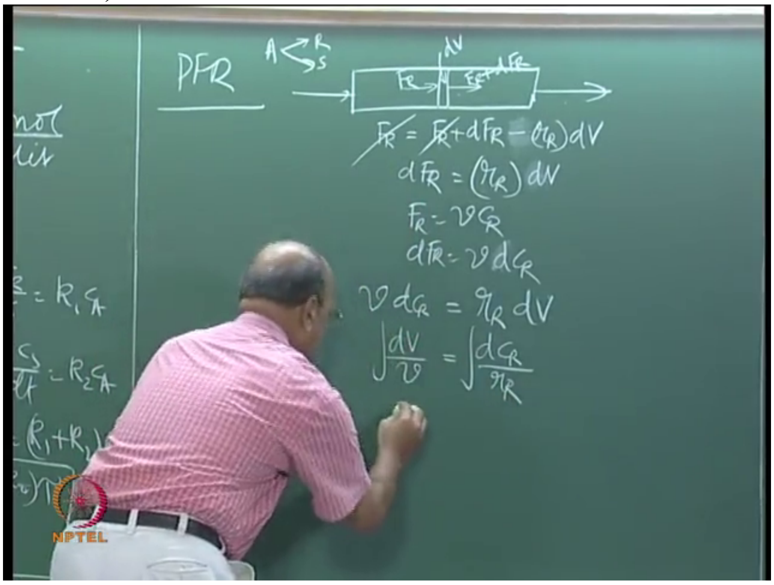

V by v which is nothing tau, this is integral zero to C R, d C R by r R.

So that is why, I just wanted

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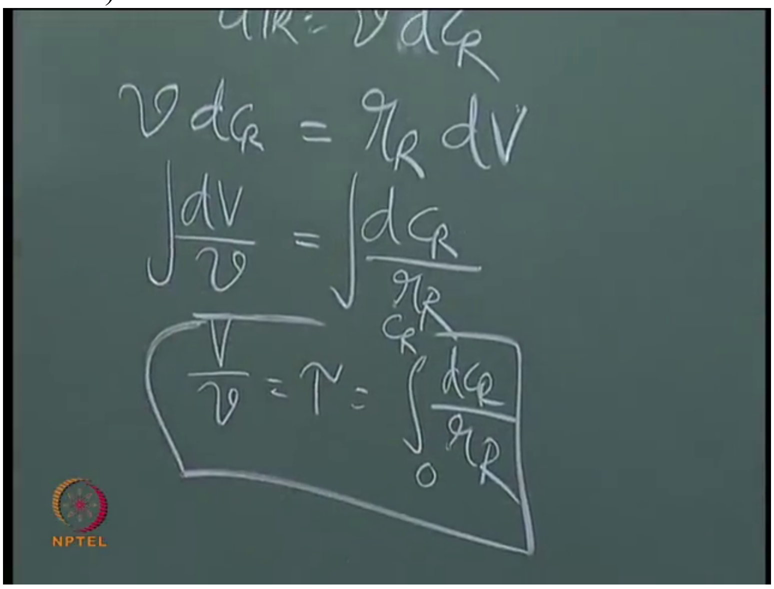

to this one do once because every time you know, even the limits also without knowing yourself you are telling C A naught to C A. That depends on what equation you are now talking about, Ok. Yeah, or this also can be written as, this equation before differentiating, this will be d tau, Ok. d V by

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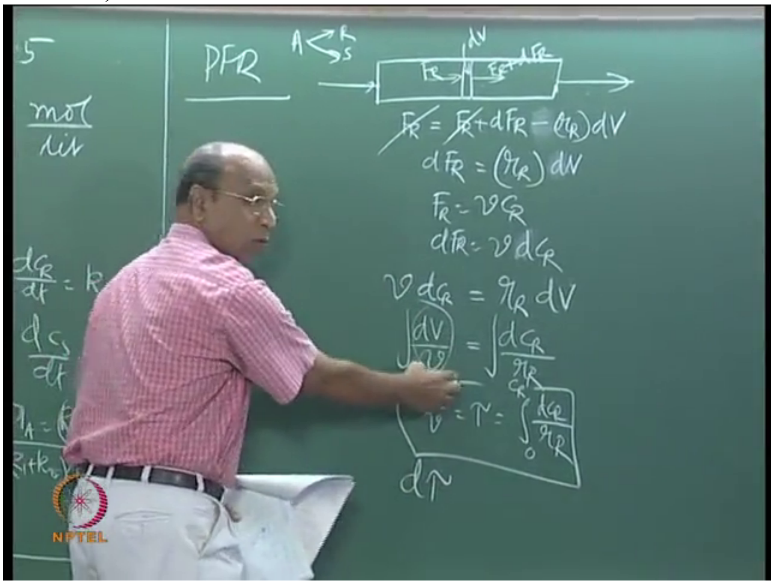

volumetric flow rate is equal to d tau, Ok, yeah, right?

Then I have this side d C R by r R, d C R by, d C R by r R,

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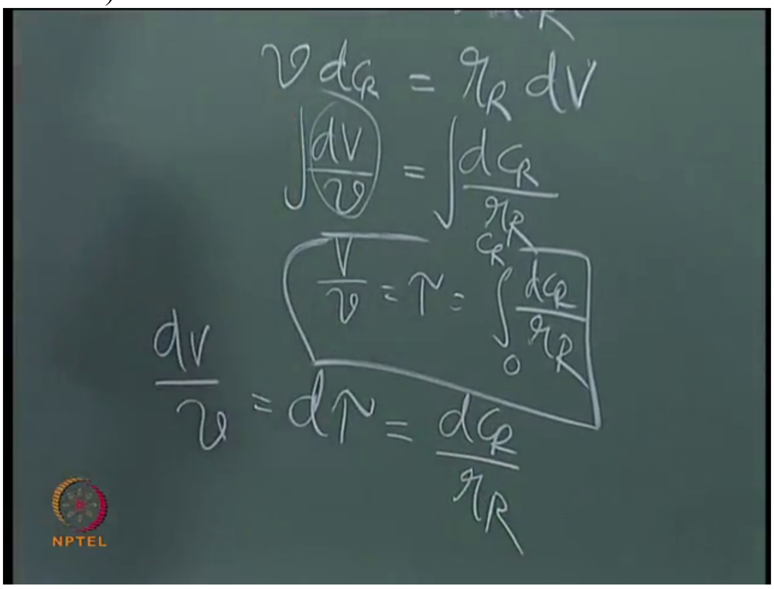

so otherwise I write this one as...that is also

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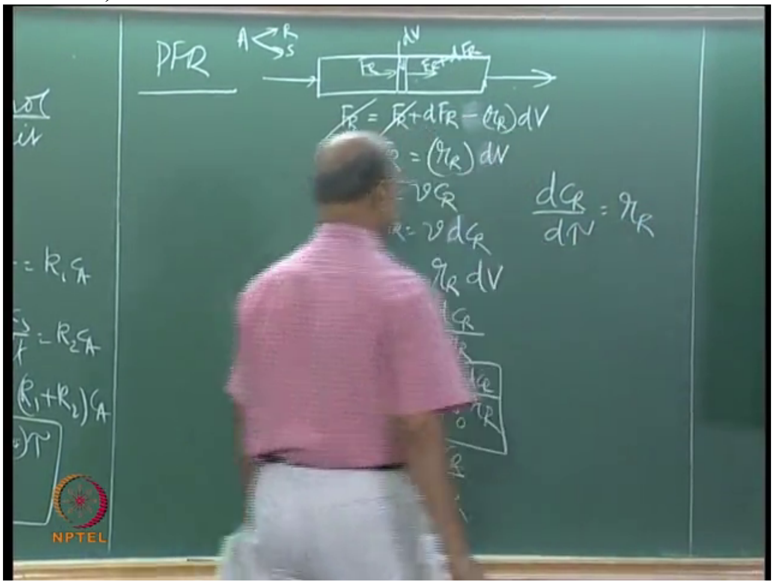

another expression which can be written. This is another format which is definitely useful. This is another format which is, I do not know whether you have seen

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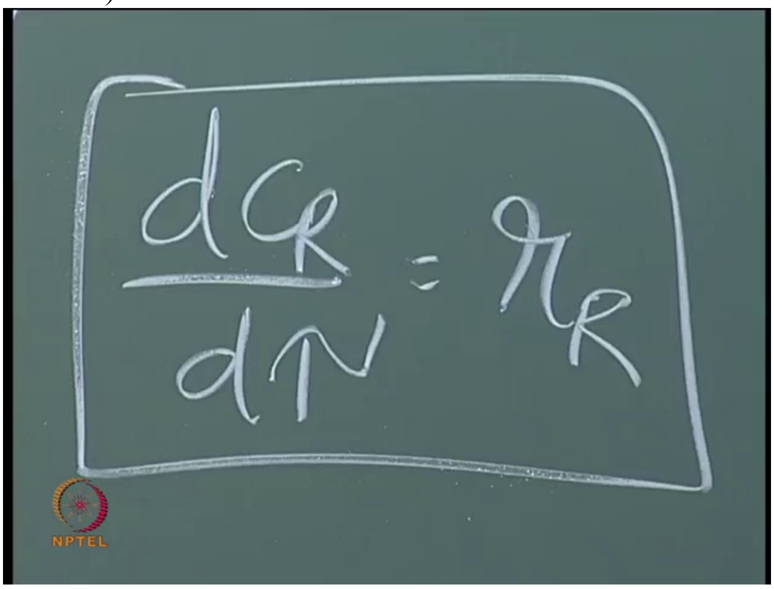

that use now, Ok. That use I will tell you immediately so that you can do it. You can do that. What is the use? Now d C R by d tau equal to r R. What is r R?

(Professor – student conversation starts)

Student: rate of product

Professor: No, in terms of equation, what is r R?

Student: k 1 C A

Student: k 1 C A

Professor: k 1 C A,

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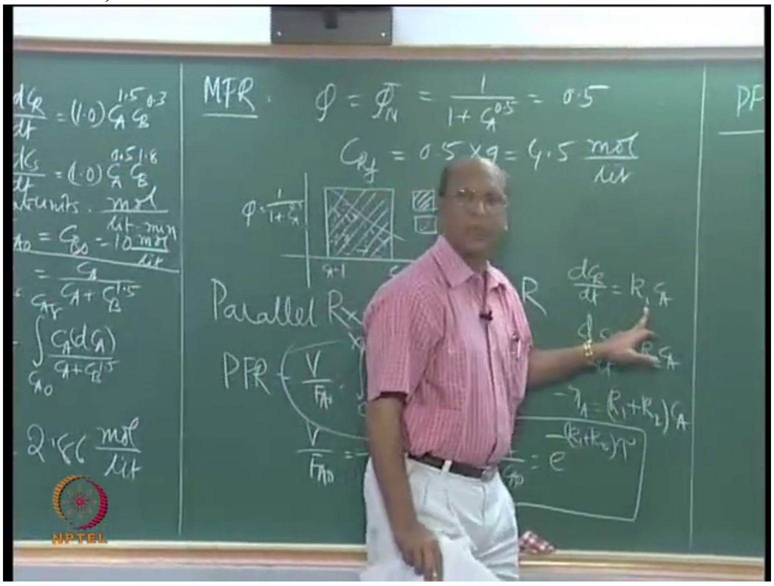

right? So it is equal to, d C R by d tau equal to, yeah I said k 1 C A.

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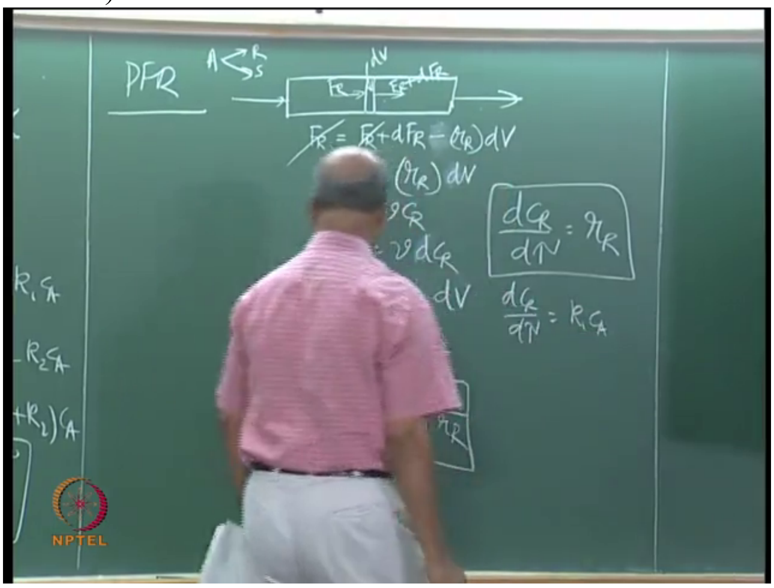

And you have equation for k 1, C A here already,

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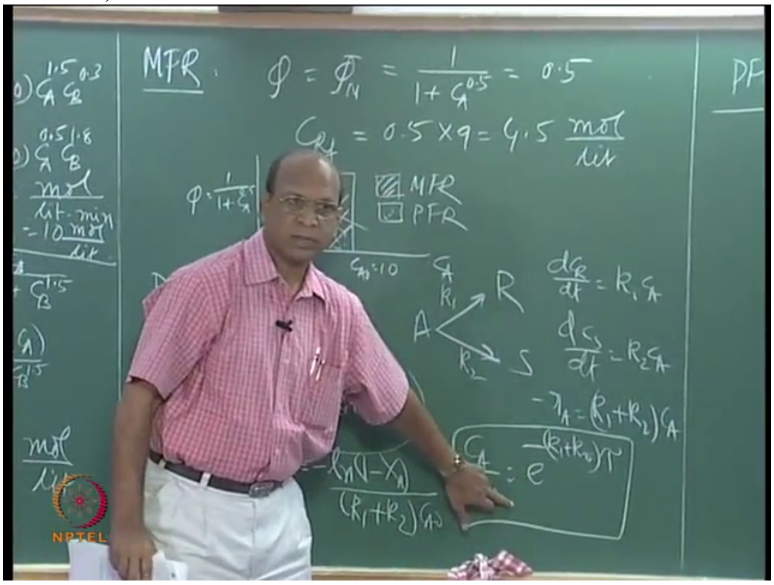

right? You have this one.

(Professor – student conversation ends)

So now you can also get C R in terms of tau, correct no? So this equation, C A by C A naught equal to this. So now d C R by d tau equal to k 1, for C A I am substituting, yeah, for C A I am substituting C A naught into e power minus k 1 plus k 2 tau.

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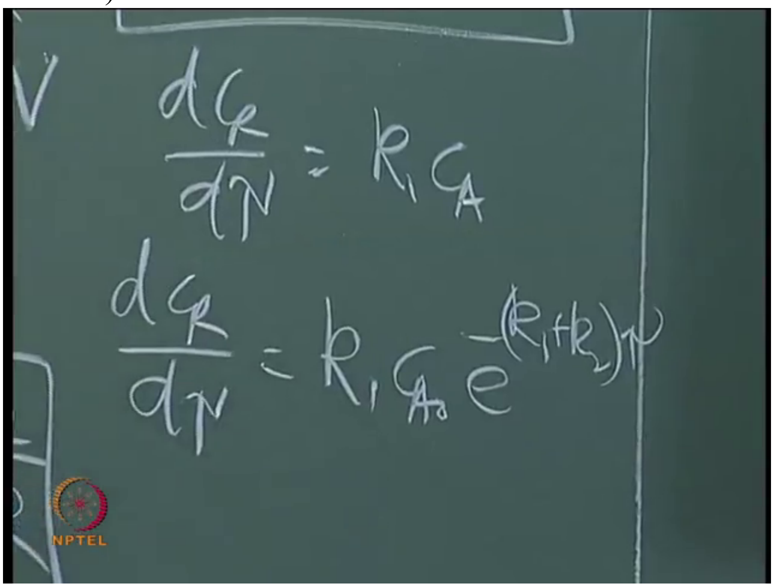

This is integral. Correct no?

Because here I have tau, this side also I have tau. So now you find out C R. Integrate it. So that you will get as k 1 plus k 1 plus k 2, k 1, k 1 plus k 2, yeah this is 1 minus e power minus k 1 plus k 2 into tau, able to see or shall I

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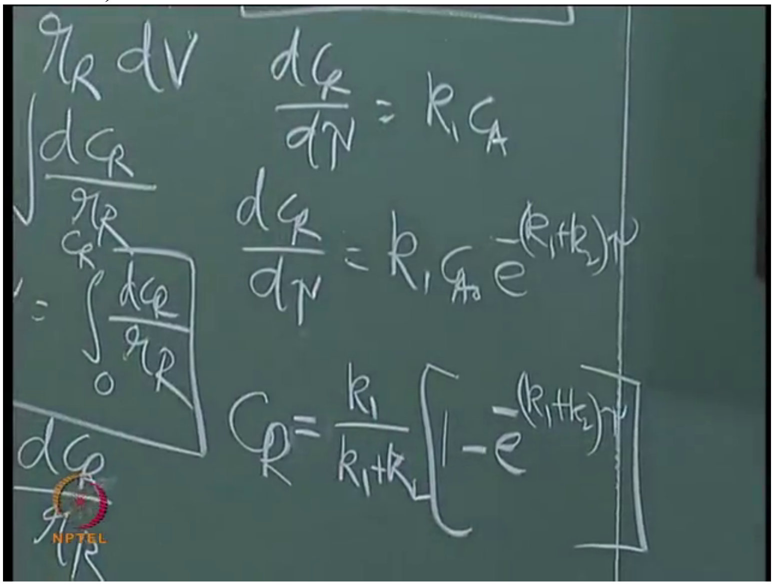

write somewhere?

So I write here? Yeah I think I will write the final one here. C R equal to k 1, k 1 plus k 2, 1 minus ...

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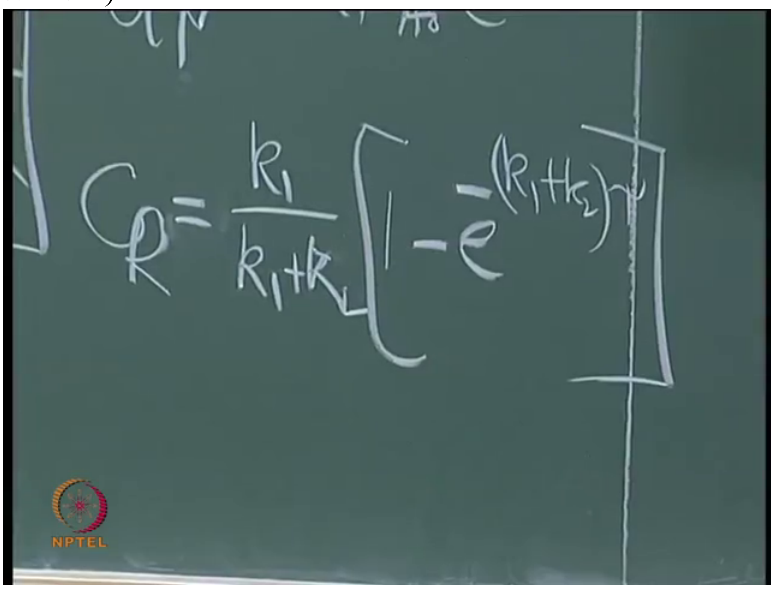

there also I missed it, no? Yeah here also...

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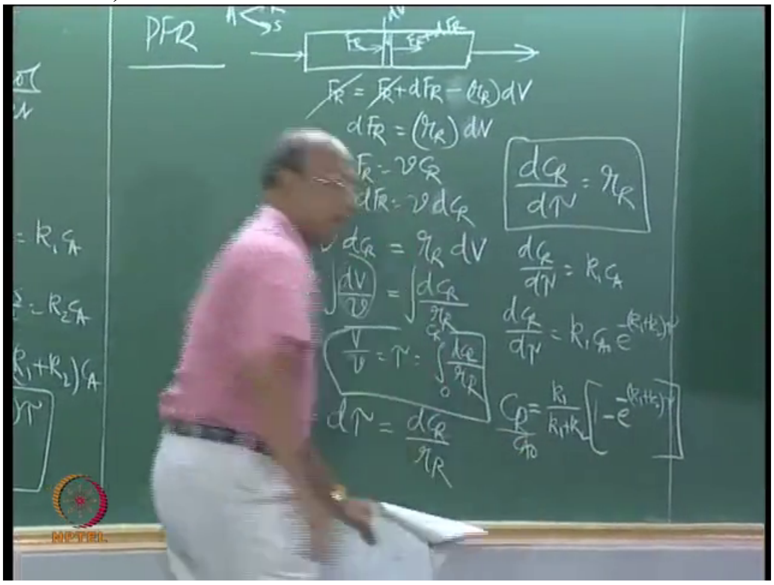

C A naught. You see this is beautiful. I think I do not know, maybe you are worried about I am making it more and more mathematical. You have to worry sometime. In C R E also you have to worry, definitely.

But you know what we can do is, from phi we can calculate C R, correct no? Yield. You substitute there and calculate tau for a new reactor. This is much beautiful, no? Right. This is not given in Levenspiel. I have taken this in some other book. Right or he has given? I think he has not given, yeah. This part has not been given, yeah.

So that is why this is another way of looking into, so we are also able

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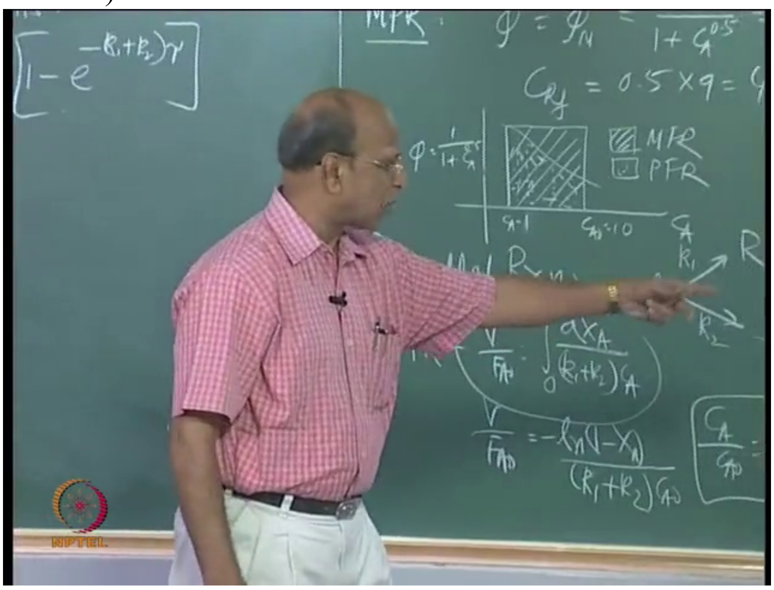

to write in terms of product where, that may be, that is slightly complicated than simple C A to calculate volumes. But normally what our idea is, from the graph or from analytical expression you calculate C R f, right?

Now you have to find out what is the volume for that C R f, for that yield. So then go to this equation. Like that for every reaction, you have to, you have taken simple reaction. The other one will be same procedure but only complicated method that is all.

So then you will have tau and because C R you have already, k 1, k 2 you know, you should know definitely, kinetics then you can calculate what is tau. That is volume of the reactor. Those things definitely, that means k 1, k 2 values you need, right? That is why...

(Professor – student conversation starts)

Student: Instead of this,

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that one is easier

Professor: Which one is easier?

Student: To get tau directly

Student: You write d X A by minus r A.

Professor: That is you are writing in terms of A.

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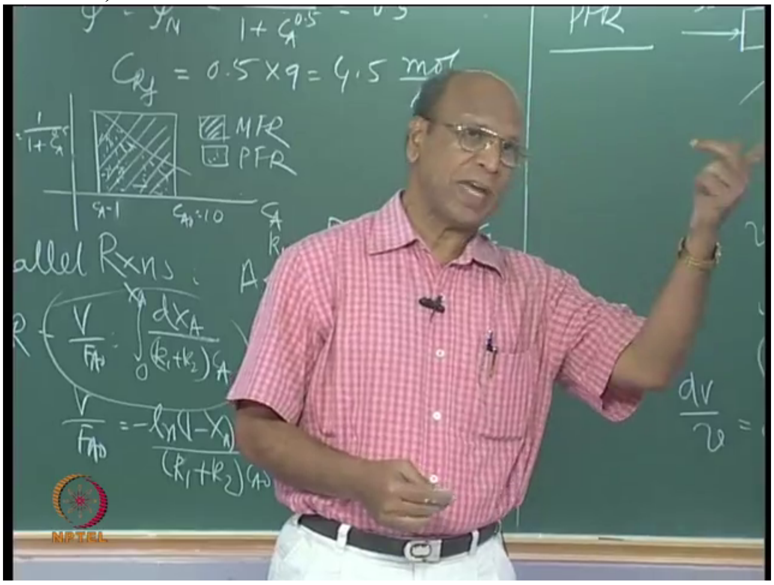

Student: No, d C R by R

Student: Anyhow we need C R, we need minus r A.

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Professor: Minus r A you need, Ok. But you know there you are now based on, calculating based on conversion of A. Here you are calculating based on yield of R, Ok. I mean both should give the same values. Tau should be same whether I use this equation, which equation? This equation

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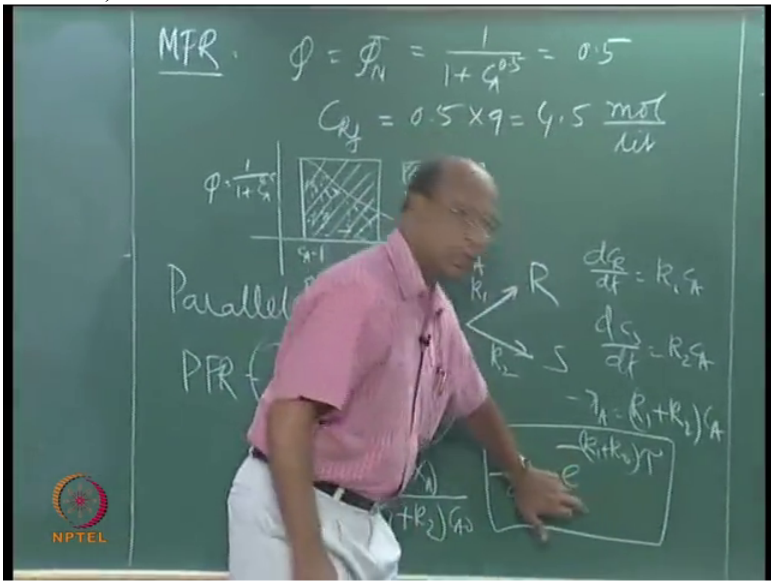

or that equation. I am just trying to tell you there is another way of doing this. Ok.

(Professor – student conversation ends)

And also we have not written till now an equation in terms of the products. So that is why, I think if at least once or twice if I write this kind of new methodologies then you will also be aware that yes, this is also possible. Yeah, so this is over now. I think this is nice.

We can also calculate from this, C S and all that, I think from material balance you know, C S equal to C A naught minus C R, minus C A Ok. That material balance I think all of you will be knowing that, Ok. So now this is only for plug flow reactor what we have written.

Now let us write for mixed flow reactor. Same, parallel reactions, mixed flow reactor. We have to write equations in terms of products also, we have to write in terms of reactants. Reactants already you know. That means reactant entering, reactant leaving, reactant reacting, Ok, yeah. So the other one is product entering, product leaving, and rate of product formation, Ok, good.

So this is M F R now, parallel reactions, same reactions, continued I will write, that same reactions continued, so what we do here is, because like exercise if you do this, I think then you will remember. Here I have volumetric flow rate, volumetric flow rate, this is total volume. Here I may have C A naught, C R naught equal to zero usually. C S naught also zero. So this side I have C A, C R, C S.

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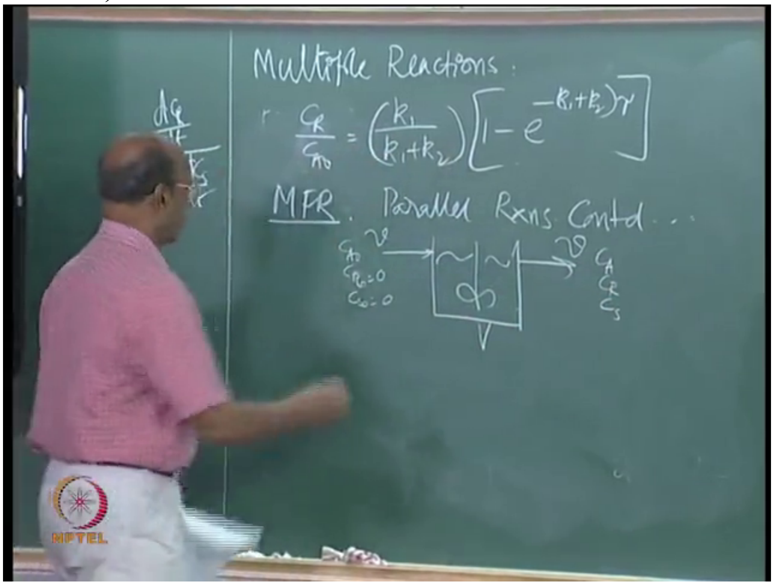

I can also write if I want, in terms of F A naught, all these F As, F A, F R, F S.

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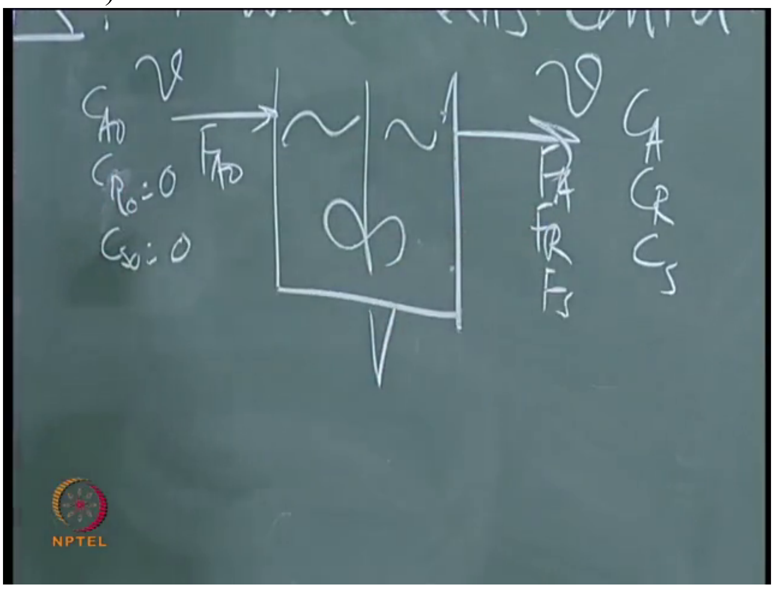

Ok, good. For parallel reactions, how do I write the material balance? Parallel reactions again to make you remember this is k 1, k 2, R and S, Ok. Usually that is a desired product, does not matter, right.

So now M B for A.

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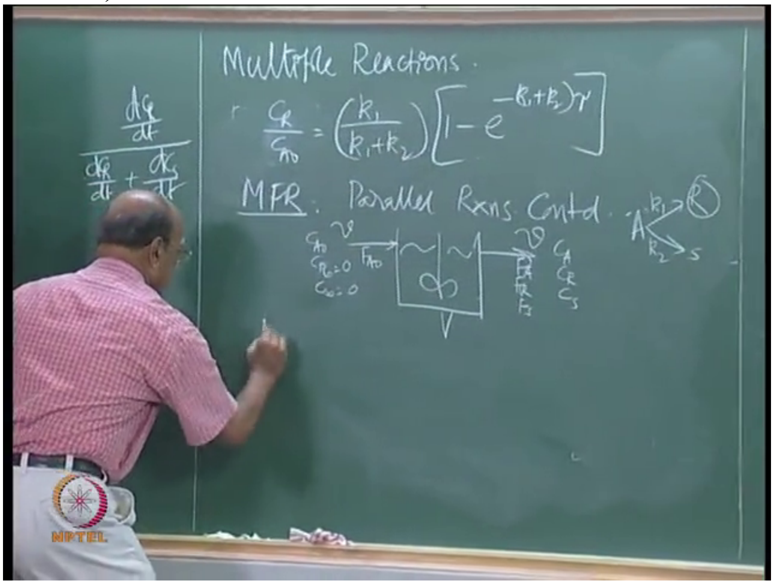

Steady state, always you know. We are not talking about any unsteady state. Ok, what is entering for A? I will ask one by one. Kalpana, where is Kalpana? Kalpana what is entering here in terms of A?

(Professor – student conversation starts)

Student: v

Professor: v into?

Student: C A naught.

Professor: C A naught. What are the, Chhaya what are the units of this, v into C A naught?

Student: Moles per

Professor: Moles per?

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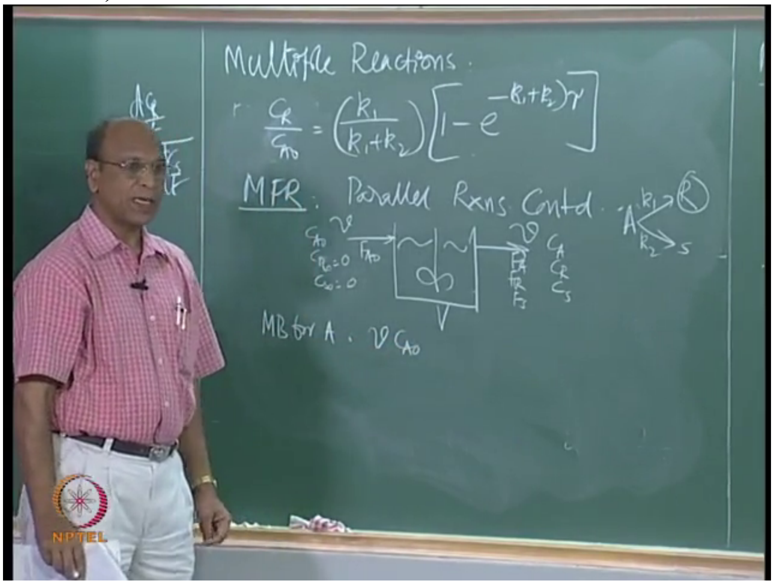

Student: meter cube.

Professor: Excellent, good so next Arya, what is leaving, from the reactor?

Student: v into C A f

Professor: Excellent, v into C A f, Ok good. Then what is reacting, who will tell, Kalpana? Very good, minus r A into V.

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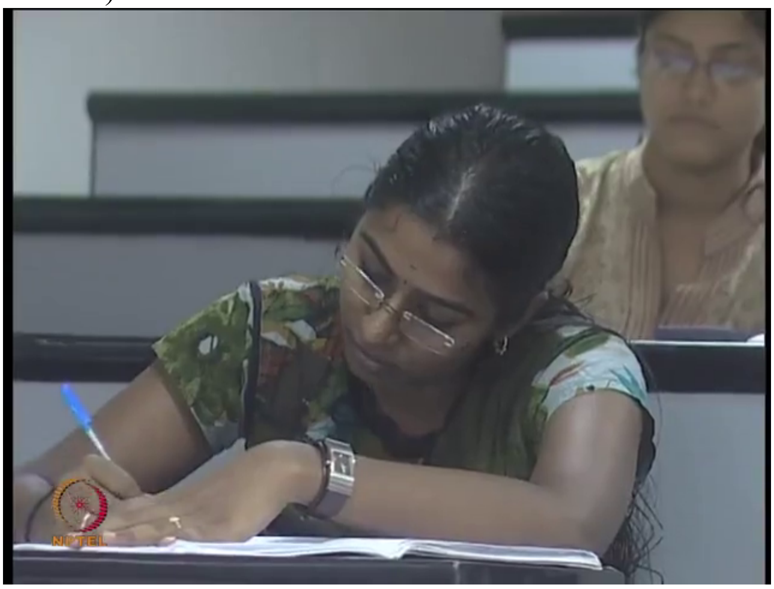

And what is minus r A here?

Student: k 1 plus k 2

Professor: For this reaction minus r A equal to k 1 k 2 C A, right? Ok. Similarly r R is k 1 C A. r S is k 2 C A,

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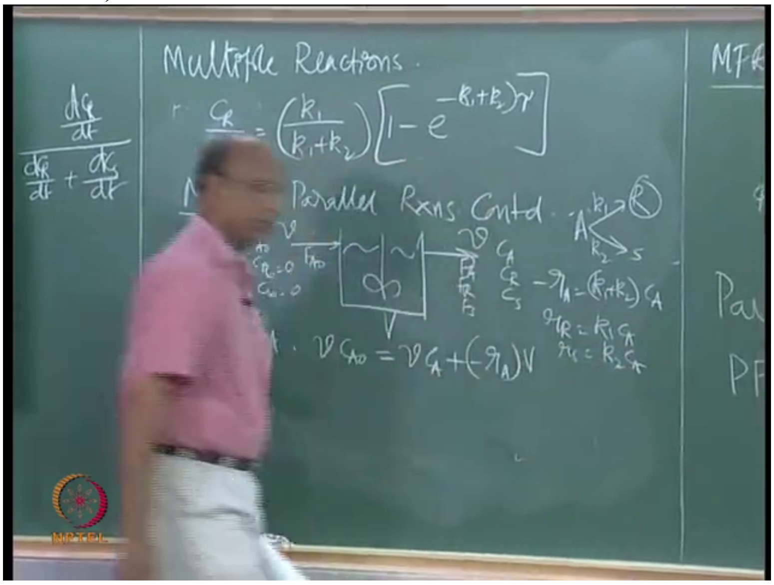

right. So, this is one equation. Then for R, who will tell for R? I think, this side? What is entering? Zero. Why zero? v into C A naught, C R naught which is zero, Ok, that is zero, Ok leaving? v C R and for reacting?

Student: r R

Professor: Yeah, r R into V. That is the equation. And for S?

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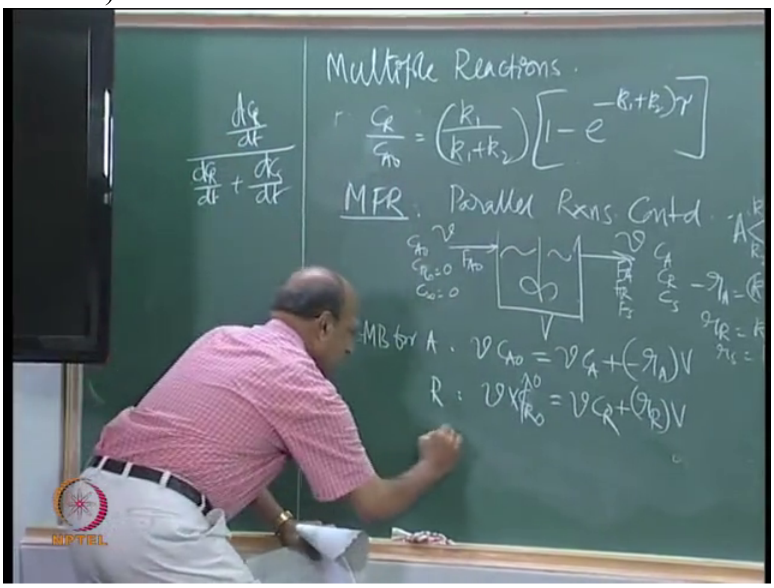

Student: r S into V

Professor: Ok, this is again zero, C S naught, V C S plus r S into V. Oh, yeah, very good, very good, minus, very nice, good, good.

(Professor – student conversation ends)

So these are the equations and then of course you can write tau in terms of either this or this or this, any equation we can use, Ok. I think I will at least try here for this. 1, 2, 3 Ok. From 1, we can write C A by C A naught equal to 1 by 1 plus....this is 4, Ok.

For C R, C R by C A naught, we can write, we can get that from those equations, k 1 tau by, Ok what should be for C S? Yeah so these are the equations.

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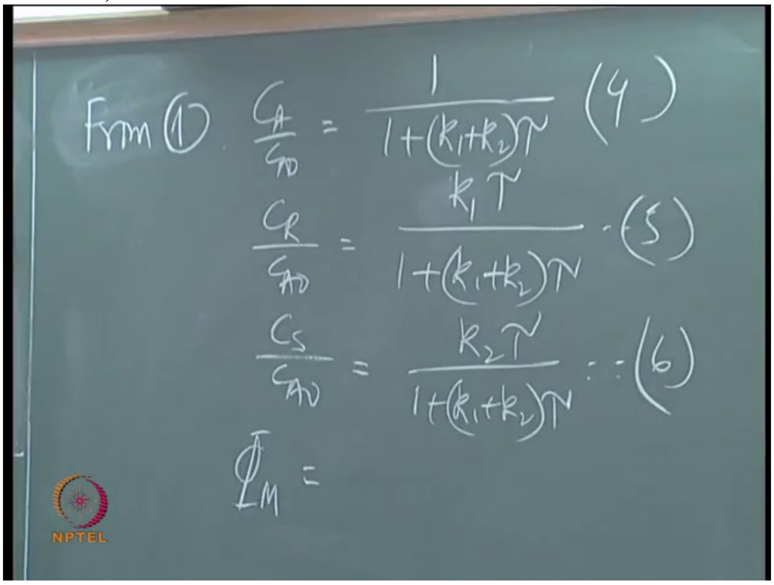

Phi M you can tell me C A by C A naught. That is phi M 1?

(Professor – student conversation starts)

Student: Yes Sir.

Professor: 1, yield 1. That is C A by, C R by C A naught, C R by C A naught.

Student: It is already there

Professor: Where is there?

Student: k by tau

Student: The equation, sir

Professor: Ok then tell me 2?

Student: C A naught into C A.

Professor: This one, 2 is what I am asking is C R by C A naught minus C A or C A f, Ok. If I take final. You are right. k 1 by?

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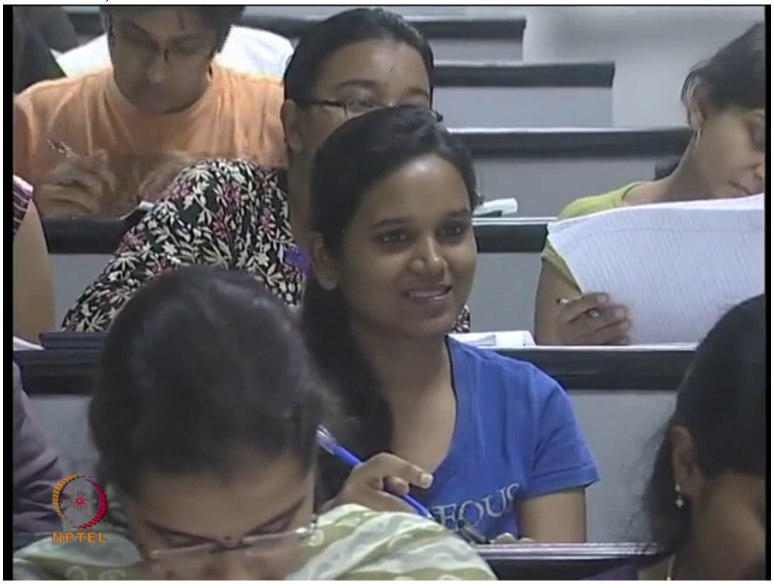

Student: k 1 plus k 2

Professor: k 1 plus k 2 (laugh) Can you also try, Pooja for phi P?

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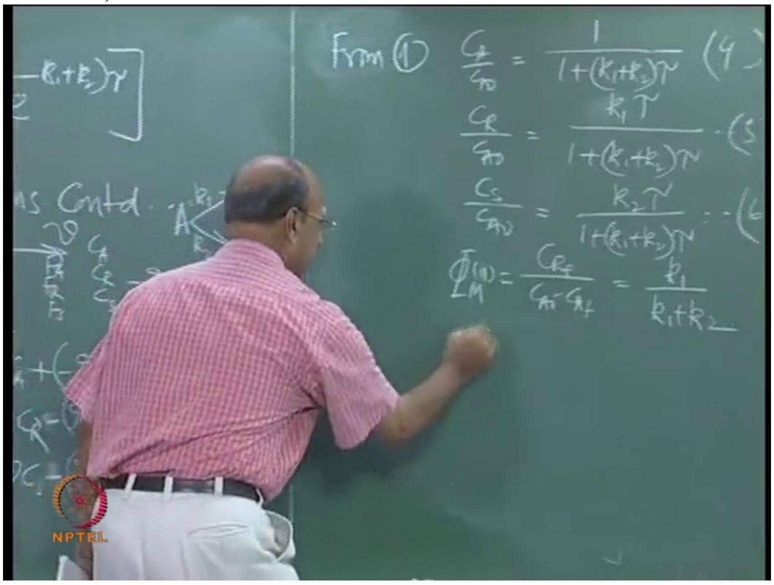

Plug flow? Plug flow I have this equation for

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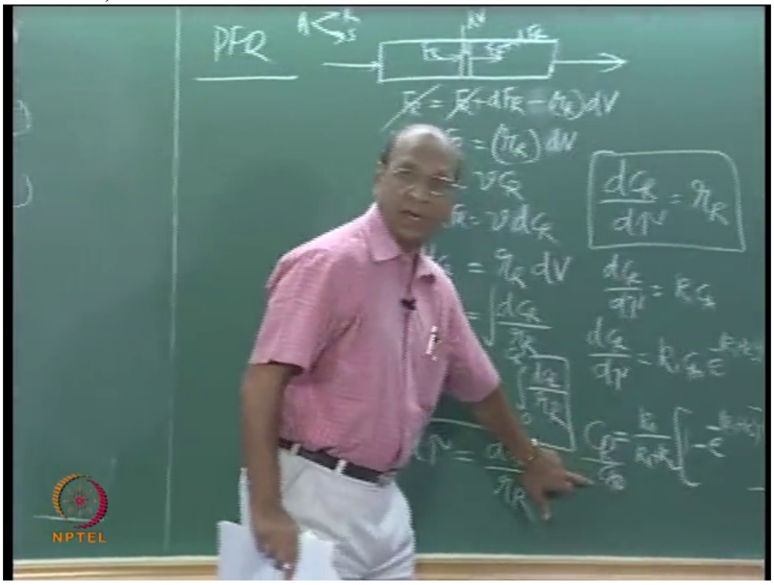

C R by C A naught. Right anyway I think we will record what Pooja told. This is also k 1...

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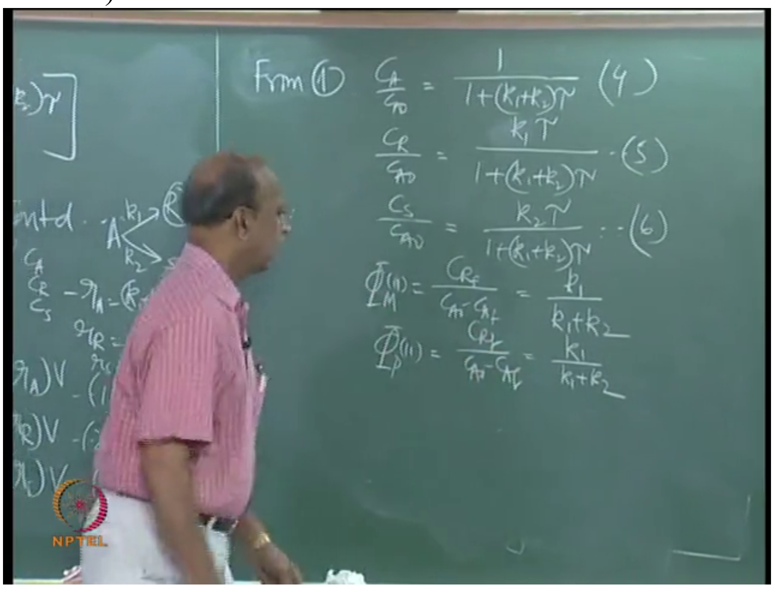

something wrong or what, what is this thing, I think P F R and? Is there something wrong, or because everyone is getting same it must be right?

Student: Same, Sir

Student: Same

Professor: Kalpana, you also got the same thing? Yes. Same thing, why? What is the problem? Why? You should not get, for plug flow and mixed flow, same thing no?

Student: Sir, anyway so much amount of C A, so much amount of R will be formed, Sir.

Professor: So. So why I think

Student: Reactor will be different in both the cases, But however, the same amount of A we add, we will get the same amount of R,

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whatever the reactor. That should be lower and

Professor: Not logical no, because I think in plug flow the contacting is different, and mixed flow contacting is different,

Student: Conversion will be lower; Sir but the ratio will be the same.

Professor: Ratio

Student: Order of desired and undesired...

Professor: Yes?

Student: Order is equal.

Student: We are making order as 1

Student: Yes

Professor: See, that is right.

(Professor – student conversation ends)

Again the basic thing

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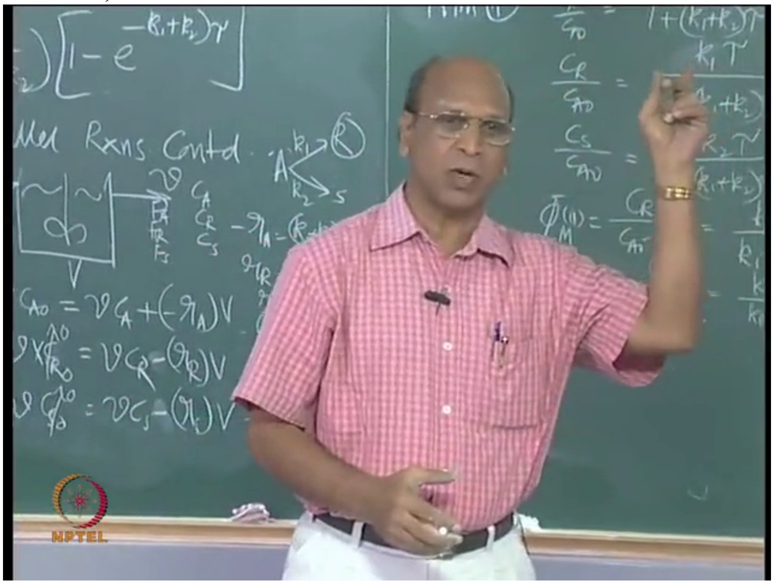

what we have learnt is, when desired product or undesired, you know, products are having the same order, concentration does not have any effect. So that means whether mixed flow reactor or plug flow reactor, concentration does not have any effect, Ok. So that is the one.

Ok. Rahul you would have told something high funda which I have not understood (laugh) Ok but you know, that is the one. Concentrations are, concentrations they do not have an effect because orders are same, Ok. So under these conditions you have to only try, if you want to have difference.

What do you try now?

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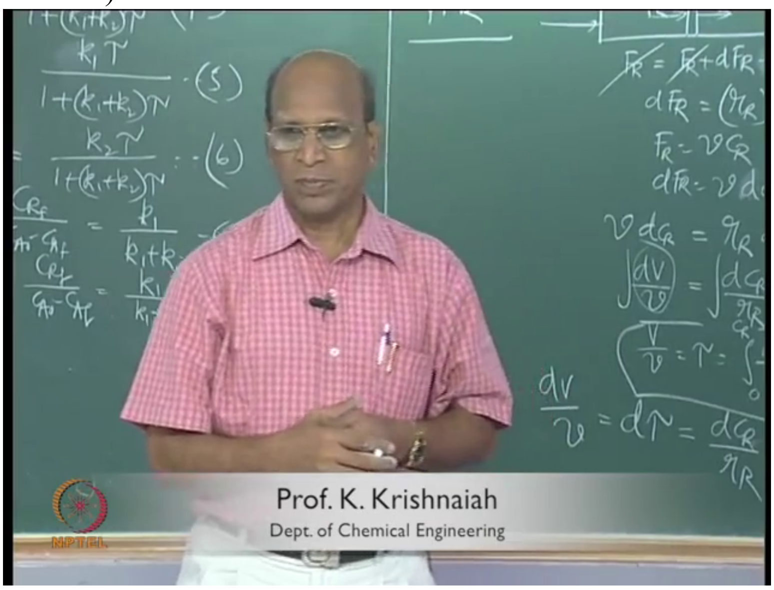

Increase not difference, you cannot have difference, temperature you have to increase so that you can get more and more, because concentration is not a parameter for you. You cannot play with concentration, either high or low.

So that is why, temperature is another one. But now temperature

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is again depending on activation energy more or less, you have to choose, desired reaction has got more activation energy or undesired product, that reaction has more activation energy. So depending on those values, again you have to increase or decrease the temperature.

Abdul what do you do if I have desired rate has more activation energy,

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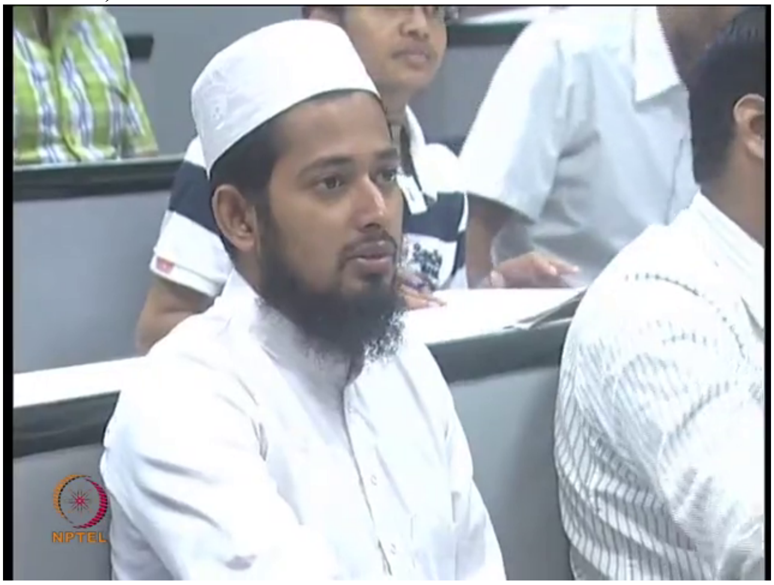

operate at high temperature. Otherwise undesired product high temperature,

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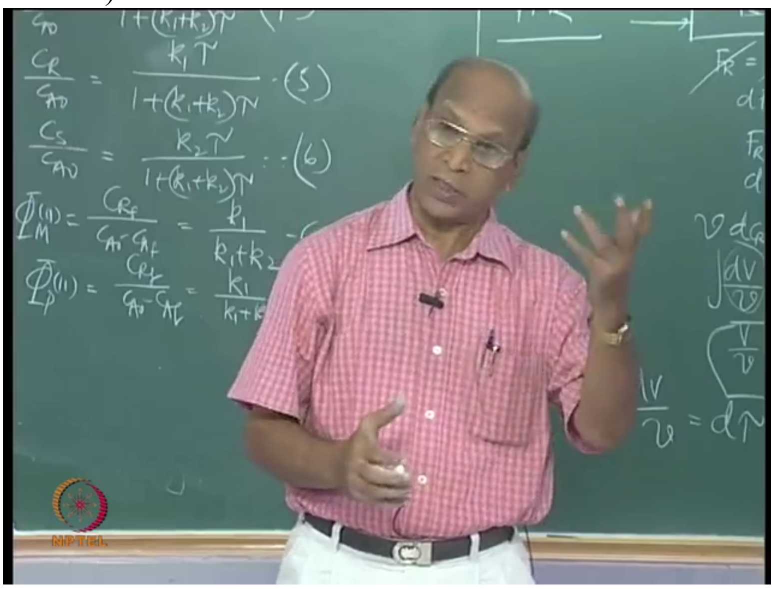

I am sorry, high energy

(Professor – student conversation starts)

Student: Low temperature

Professor: Then you have to have low temperature. Then only you will get comparatively better products,

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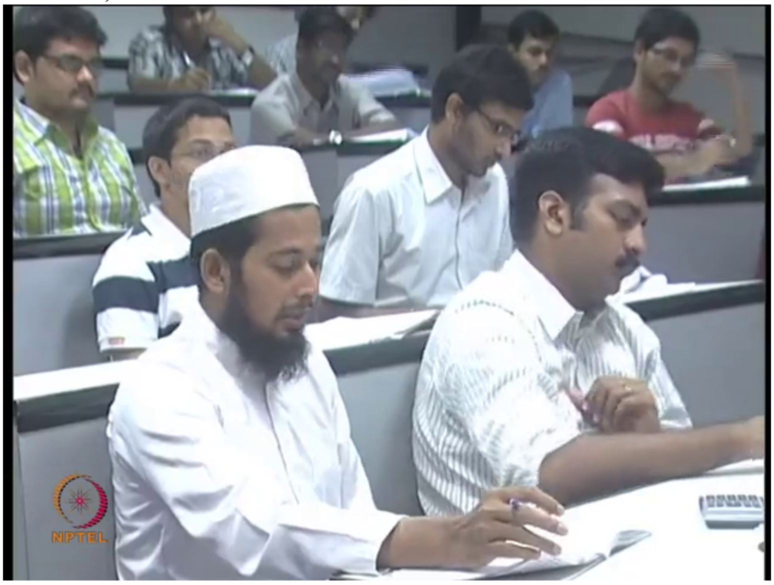

better yield

Student: More R than S

Professor: Ok, good,

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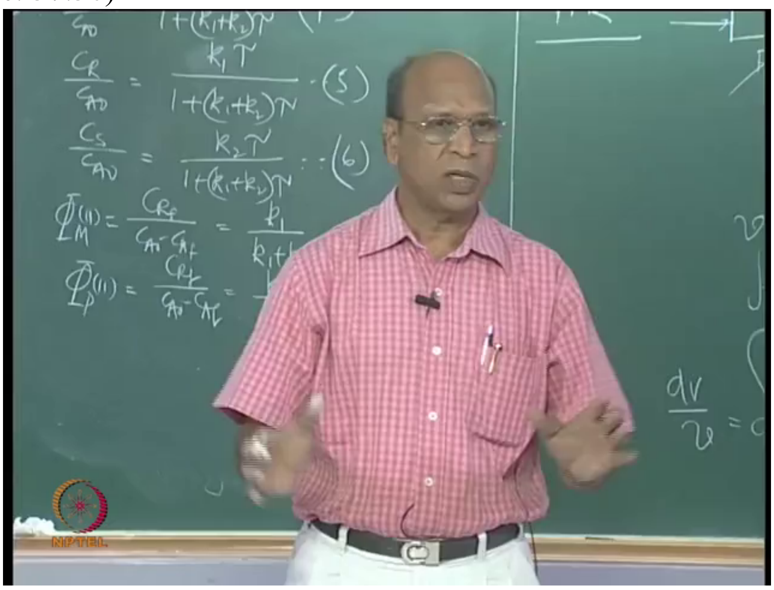

very nice, good. So I think this we will close now. We will stop and then

(Professor – student conversation ends)