Hello students and welcome to this video.

I'm Miss Pearl de Santos assistant professor,

Camel college for women, Nova, Goa.

In this video we're going to look at a

chapter from the Bachelor of Science syllabus.

Chemistry Semester CHC101

inorganic and organic chemistry.

We're looking at aliphatic

hydrocarbons and we are going to

learn how to prepare alkenes by

the method of dehydrohalogenation.

So we're going to look at the

dehydrohalogenation of alkyl halides.

We're going to applyy the saytzeffs

rule to identify which is

going to be the major product,

and then we're going to look at

the mechanism of the reaction.

What we wish to learn from

this is to understand the

dehydrohalogenation of the alkyl halide.

Apply the saytzeffs

rule,

and understand the mechanistic

pathway whether it will be

E1 or East 2 mechanism.

So let's begin.

An alkene can be prepared from an

alkyl halide by the removal ofHX,

also called as hydrogen halide.

The alkyl halide that can be

used can be either a tertiary or

secondary or a primary alkyl halide.

And the halide has to be either bromine,

iodine, or chlorine.

The base can be a hydroxide or an alkoxide,

and what is done is the hydrogen beta to

the halogen is going to be abstracted,

so if this is your alpha carbon

this is your beta carbon,

so we have the beta hydrogen

abstraction and that is why it

is called as beta elimination.

So it undergoes beta elimination

to give you the alkene.

Now, if you have an unsymmetrical ikene,

you could have two possible beta hydrogens

that could be abstracted and thereby

you could get two different products.

Now how do we identify which

could be the major product?

This can be done by understanding

the Saytzeff's rule.

So what does Saytzeff's rule state the

Saytzeff's rule states that the alkene

is obtained when a proton is removed

from the beta carbon that is bonded to

the fewest number of hydrogen atoms.

In simple words,

this means the most substituted

product would be the most stable

and the most preferred 1.

So the formation of a Tetra substituted

double bond is going to be preferred over.

Tri followed by Di and Mono.

So the one that gives you the

more substituted product is going

to be the most stable product

according to the Saytzeff's rule.

So if you look at this reaction over here,

you have two hydrogens that could

be abstracted and therefore you

have two different products that

are formed now the one that is

going to be major is going to be.

This one because it's.

More.

Substituted.

So this is going to be a major product

and when a reaction gives you one

product in major over the other,

it is called as regioselective.

So this reaction is regioselective

in nature.

Now if you have a substrate

that already has a double bond,

then the major product that could

be formed is the one that would

give you the conjugated product.

OK, so over here again you have two

possible hydrogens that could be abstracted.

The major product is going to be this

one because this one gives you the

most stable product because the double

bonds are in conjugation with each other.

So this is going to be the major product.

So whenever you have a reactant

that contains a double bond,

the product is going to be major,

which gives you the conjugated product.

If you have a bulky base as such,

then what happens is because of the bulk

and because of the static hindrance.

We are unable to get the saytzeff’s

product as the major product,

So what it does is it abstracts the

hydrogen which is least hindered.

So now you have two hydrogens that

are beta and could be abstracted,

but it is this hydrogen which is.

Less. Hindered, So what happens is

this bulky base being very bulky

nature having lot of carbon around

it becomes sterically hindered so

it abstracts the hydrogen which

is least hindered and that is why

this becomes your major product.

So always remember,

if you have a bulky base then

the product is going to be the

opposite of these sets of product.

So here we have a table and

we have different alkoxides.

We have ethoxide,

tertiary butoxide and so on.

So if you look at it closely you will see.

The bulky nature of the base

increases as we go down this table,

and therefore if you see the product,

what do you get is the.

Anti Saytzeff’s product becomes major

the more bulky the base is.

OK so bulkier the base you get the

opposite product of the state rule.

So this table makes things very clear

that bulky base gives you the opposite

or the least substituted double bond.

Now the double bond could be

having different stereochemistry,

either it could have trans

stereochemistry or cis stereochemistry,

so it is observed that.

The reaction gives you the trans

double bond in major quantities,

so it is a stereoselective reaction.

Always remember the trans double bond is

the major product over the SIS double bond.

Now let's look at the mechanism.

Depending upon the alkyl

halide and the conditions,

the mechanism could either

undergo E1 or E2.

Let us go to see what is

this E1 and E 2.

The E2 mechanism has the

following key points.

That is, go through it.

The rate depends upon the

alkyl halide and the base,

and since the rate depends upon two things,

that is the alkyl halide and the base.

It is bimolecular and therefore

you get this number 2 because

the rate depends upon two things.

One is the alkyl halide and also

the reagent which is the base.

So the rate depends upon the

abstraction of the proton as well

as the cleavage of the CX bond.

It's a second order kinetics

and the order of the halogen

reactivity increases in this order.

Chlorine, bromine and then iodine.

The mechanism is a one step mechanism.

Let us see how it goes.

So what happens is the base

picks up the beta hydrogen.

These electrons go and come

between the carbon carbon.

atoms and then what happens is

the CX bond breaks OK so OH picks

up the proton the electrons go to

form the double bond between the

two carbons and the CX bond breaks.

So it's a one step mechanism.

This is your E2 mechanism.

Let us look at the E1 mechanism.

Now E1is given by some secondary

and tertiary alkyl halides,

and usually when the solution

has low base concentration it

undergoes E 1 mechanism.

It is unimolecular that means the rate

of the reaction only depends upon

the alkyl halide and not the base.

It's a two step mechanism.

The reaction depends upon the cleavage

of the CX bond and the reactivity

of the halogen increases in this.

Order Iodine most reactive followed

by bromine and then chlorine.

So alkyl halides which are tertiary and

secondary usually undergo the E1 mechanism.

So if you go to see the.

Mechanism what happens first

is a two step mechanism.

The first step is the CX bond breaks,

giving you a carbocation

and then what happens is the

proton is abstracted by the base.

Here you can have two different

protons that could be abstracted,

resulting in a mixture of CIS and trans.

But the trans is going to be major product,

so difference between E1 AND E2

E1 is a two step mechanism.

Even under goes by the

carbocation intermediate,

followed by the abstraction of the proton,

whereas E 2 is a one step

concerted mechanism.

These are the references.

Thank you.