Hello students myself, Ms Ravina Jalmi and I am from PES College

I will take module number 14.

For paper, general industrial chemistry and the paper code is CHC 153.

So this is the paper code. As you can see on the screen that

is CHC 153, and the paper title is general industrial chemistry.

This is Unit 6 which is coming under Section B and unit name is

halogenation. Module name is halogenation and reagents for

halogenation and this is module number 14.

This is the outline.

We Will be studying halogenation and reagents for halogenation.

These are the learning outcomes, in this module we will be studying about different

types of halogenation reactions with its examples.

This module also cites examples of different types of reagents used for halogenation.

Then we will be also studying kinetics of halogenation.

These are the subtopics which i will cover in this module,

that is halogenation reagents,uses of halogenation and kinetics of halogenation.

So students we will study about halogenation.

So halogenation is defined as the process whereby one or more halogen atoms are introduced into an organic compound.

The preparation is accomplished by a variety of methods and the conditions, and procedures differ not only for each member of the halogen family but also with the type and structure of the compound undergoing treatment. And these halogens may involve reactions like, addition, substitution reaction that is, hydrogen, nitrogen atom gets substituted.

Then the replacement reaction, that is of the groups like hydroxyl group,sulfonic acid group, etc.

Here are some examples of halogenation reactions. As you can see on your screen. So the first one is of acetic acid reacting with chlorine gas to give chloroacetic acid, and HCl which is a byproduct.

Second example is Ethyl alcohol reacting with HCL giving, C_2H_5Cl that is chloroethane plus water is a byproduct.

Third one is ethylene reacting with bromine to give 1,2-dibromoethane. So these are three examples which I have given for halogenation reactions.

Each type of reaction may involve not only a specific halogenation agent, but also a suitable catalyst.

So catalysts, like Iron,antimony and phosphorus etc. are used to a large extent.

Iodine and bromine which are capable of forming mixed halogens with chlorine are also employed as catalysts in chlorination processes.

I have given some halogenation reactions which are as follows.

So students first one is chlorination and the example which I have given is by direct action of chlorine gas. In the structure in which you can see the methyl group attached to the benzene ring it reacts with chlorine gas, you get benzyl chloride.

Apart from chlorine gas many different types of chlorinating agents like hydrochloric acid, sodium hypochlorite, Sulfuryl chloride etc are also used.

Next is bromination.

Bromination may be carried out in a similar manner as that is employed for the preparation of chlorine derivatives.

Bromination agents like bromine, hydrobromic acid, alkali hypobromite, etc are used. Here is an example of bromination reaction, where ethylene is reacted with bromine and we get 1,2- dibromoethane.
Next is iodination.

In iodination, the relatively weak carbon-iodine bond, which is

indicated by the low heat of reaction which distinguishes iodine from other halogens, makes permanent,

direct union of carbon to iodine by the replacement of hydrogen possible only in exceptional cases.

And such iodination reactions are reversible in nature, as in case of iodination of acetic acid.

And I have given this reaction in the next slide.
Apart from Iodine other iodination agents like Hydroiodic acid, alkali hypoiodite, like the corresponding chlorine and bromine compounds are used in iodination reactions.

So this is the reaction that is iodination of acetic acid,

acetic acid is reacted with iodine, we get iodoacetic acid with byproduct

hydrogen iodide.

Next one is fluorination.

In fluorination, Fluorine acts directly upon hydrocarbons to produce fluorides, either by substitution or by addition, but the element fluorine is troublesome to handle.

The bonds holding the atoms in the fluorine molecule are

stronger than in any other halogens, but once the

reaction is initiated and fluorine atoms are available, they combine more readily with hydrogen and hydrocarbons than do the halogens of higher molecular weight.

And Furthermore, the new bonds which are formed are so strong

and the heat liberated is so great that the precautions must

be taken to moderate the reaction so as to keep it under

control. So students, this is the example of fluorination

reaction that is hydrochloride of amine reacting with sodium fluoride to give RF, with the release of ammonia and we also get NaCl as a byproduct.

Next is kinetics of halogenation.

The rate of a chemical reaction is determined primarily by the magnitude of activation energy.

And students, this is the equation that is

k = se - A upon RT where K is the specific rate constant,
A is the activation energy and s is a proportionality constant which has only a small temperature variation.

So lower the magnitude of A, the faster the rate of reaction.

And owing to the exponential effect, one reaction will predominate over another if its activation

energy is only one kcal lower than that of a competing reaction, provided that their '**s'** factors are of comparable magnitude.

So, the one reaction will predominate over another If

it's activation energy is only one kcal lower than that of a

competing reaction, but their 's' should be of comparable magnitude.

This is the reference which I referred to prepare this PPT, that is UGC study material for second year

industrial chemistry.

Thank you.