Hello everyone, welcome back to another class

of inorganic chemistry of semester five.

I'm doctor Pritam Patil,

assistant professor, PES College of

Arts and Science Farmagudi Ponda, Goa.

Today we are going to discuss

interhalogen compounds.

Their Structure and bonding.
Outline structure and bonding with respect to.

ClF, ClF3, IF5 and I F 7.

At the end of this module,

students will be able to describe the

structure and discuss the bonding in

ClF, ClF3, IF5, IF7 and other interhalogen compounds.

Let's see bonding in first type

that is A X type example is ClF and ICl.

So here we see the example of ClF.

In this central atom is chlorine,

the ground state configuration

of chlorine is 3s2 3p5.

There are two electrons in 3s2

and 5 electron in three P orbital.

Now when this chlorine gets excited,

there is no change in the

distribution of electrons.

So let's see chlorine in ClF.

Chlorine and fluorine.

They undergo SP3 hybridization

giving 4 SP3 hybrid orbitals.

Now there is only one unpaired electron.

In chlorine and fluorine also

has one unpaired electron.

So fluorine gives its one electron

to chlorine and it forms a bond.

Now this is the structure of ClF.

If we see a geometry of SP3 hybridization,

it has tetrahedral structure with three lone

pair of electrons and one bonding pair.

Based on the VSEPR theory,

the shape of the molecule is

linear with one covalent bond

that is 1 covalent bond.

Now let's see the bonding in ClF 3.

Here also central atom is chlorine

with the ground state configuration

3s2 three P five.

There is only one unpaired

electron in P orbital.

Now chlorine when it gets excited,

one of the pair,

the electron from one of the pair gets

excited and it gets promoted to 3d orbital.

Now as we can see there are three

surrounding atoms.

There has to be 3 unpaired electron

to pair with so one electron gets

excited and it goes to 3d level.

Now chlorine when it is bonding in ClF3

there are three unpaired electrons.

Now these three unpaired

electrons are bonding with the

three unpaired electrons from 3 Flourine.

It undergoes SP3 hybridization and the

geometry expected geometry for sp3d

hybridization is trigonal bi pyramidal.

Now as we can see,

there are two lone pair of electrons and

there are three bonding pair of electrons.

According to VSEPR theory,

lone pair of electrons do

not contribute to the shape.

So we can see the shape of the

ClF3 molecule as T shape or it is bent T.

Let's go for bonding in IF5.

In the third type that is AX5 type.

Here example is IF5.

Here the central atom is iodine with

the ground state configuration 5s2 5p5

with one unpaired electron in P orbital.

When Iodine gets excited now here, we can

see there are five surrounding atoms

so there has to be 5 unpaired

electron to bond with.

So here 2 pairs of electrons.

The electrons from these two pairs get

excited and they are shifted to the d orbital.

So now all together there are

five unpaired electrons.

So, these five unpaired electrons require

five more electron to form a bond.

So, these.

3P orbitals,

1S orbital and 2d orbital.

They undergo sp3d2 hybridization

and they form.

These orbitals and now five electrons

from 5 fluorine atoms contribute

electron to form 5 bonding pairs.

So, if we see the expected geometry

is octahedral because there is

and there is one lone pair and

five bonding pair and according to

VSEPR theory the shape of the molecule is

square pyramidal because there is

one 1 lone pair of electrons

which occupy the sixth position.

Next is bonding in IF7.

In this is the only one example of AX7 type.

Here in IF7 central atom is

Iodine with configuration 5s2 5p5

with one unpaired electron.

When it gets excited,

all the electron pairs they give

its electron to the next level.

So, all 7 electrons are unpaired

electrons and there are seven chlorine

atoms which give 7 electrons to.

Form 7 bonding pair here the

hybridization is sp3d3 and the geometry

for sp3d3 is pentagonal bipyramidal.

Now,

since all electron pairs are bonding pair,

the expected geometry and the

shape of the molecule is same that

is pentagonal bipyramidal,

so, these are the structures of

different molecules and their bonding.

These are the references.

For this module.

Thank you.