Hello everyone, I'm Pearl Dos Santos, assistant Professor,

Camel College for women and today I'm going to discuss

resonance effect. This course comes under the Inorganic

and Organic Chemistry paper code, CHC 101.
What we're going to look at in this power Point is, what is resonance?Resonating structures and

resonance hybrid conditions for resonance types of resonance and

applications of resonance. The Aim of this course is so that we

can learn the concept of resonance . The condition

of resonance and to explain the chemical reactivity of certain

compounds. Now what is resonance? Resonance is

basically the movement of electrons between atoms of the

same molecule. molecule resonates to attain stability.

More the number of atoms in a molecule that resonate more

stable will be the compound and therefore it will be less

reactive. Now this movement of electrons will result in

structures that are different in the position of the electron

pair. These structures are called is resonating structures

and the actual molecule is a combination of all these

resonating structures and this is called as resonance hybrid.

molecules that have the general

formula A double bond B single bond X, where X is an

Atom that contains double bond, lone pair, triple bond positive or negative charge.Either one of this, then such a compound will undergo resonance.

Now if you look at the following examples, they all are in the representation of A double bond B single Born X. I have highlighted the X atoms in all the examples in purple color for better understanding. In This case, the X Atom has a double bond and will undergo resonance. In this case, the X Atom has the lone pair of electrons and it will undergo resonance and in this case the X atom has a triple bond.

The next kind of molecules that undergo resonance is of this type, A single bond B.

Where A has either a lone pair or negative charge and B has a positive charge. An example would be this compound.

Here you have the lone pairs of electrons on nitrogen, which can stabilize this positive charge with resonance.

Now, while drawing a resonating structure, what we're going to show is the movement of electrons from atoms. OK, so we can show the movement of electrons by using a double headed arrow. This part of the arrow shows you.

From where the electrons are going to originate And this part of the Arrow tells you where's its going to end

this is very important.

Now, in this case the resonating arrow will be.

This way.

And this way notice the arrow is between the bond of carbon and

oxygen. That means the electrons are equally shared between both

the atoms and the movement of electrons is on region of higher

electron density to a region of lower electron density.

Now, while drawing our resonating structure, one must

also consider the conditions and rules. The first condition is

that the structures must only differ in the position of the

electronic pair. The second one says that they must have the

same number of unpaired

electrons. Let us understand this with an example.

This is resonance of aniline,as you can see, the arrows are

moving. It shows the movement of electrons.

Now if you go to see all these structures have the same number

of unpaired electrons, that is one.

OK, and these structures they only differ in the position of

the electronic pair.

The next condition is the energies of the various resonating structures must be similar in energy and all these resonating structures do not contribute equally towards the resonance hybrid. The Contribution towards resonance hybrid depends upon the stability of the resonating structure and this stability depends on the following conditions. Number of covalent bonds, higher the number of covalent bonds in a resonating structure to a larger extent it will contribute. Charge Contributing species are less stable.

They are less stable so they will contribute to a lesser extent, and when the charge on the electronegative Atom is negative, is going to contribute to a higher extent.

Now the effect of resonances of two types, if the functional group is electron donating in nature is going to be a +R effect and with a functional group is electron withdrawing.

In nature, it will have a - R

effect. These are the examples of electron donating and electron withdrawing groups respectively.

Now if you look at the first case, the π electrons are being withdrawn by this functional group. OK, so it is exhibiting a

-R effect.

In this example, the functional group is donating its electrons

and therefore this will have a.

+R effect

Now if you look at the following examples, these are all electron

withdrawing in nature and therefore they come under - R effect.

In this case, they are all donating in nature, the

functional group and therefore they are +R effect.

Now coming to the application of resonance effect.

Resonance can explain the reactivity, acidity or basicity

of compounds. We're going to see how resonance effect explains

the acidity of carboxylic acids, and basicity of amines. So essentially, an acid is a proton donor and a

compound can donate protons easily if the bond that

contains the proton is weakened. OK, so in the case

of carboxylic acid, this bond between the oxygen and the

acidic proton is weakened because of the resonance of

these lone pairs of oxygen with the carbonyl system.

Therefore this bond is weaker and this can be lost easily

and therefore it is an acid.A similar example can be

given for phenols as well.

Now coming to a base, the definition of a base is it has to be an electron donor. When The lone pairs.

Are localized on the Atom,they are better electron

donors as compared to if they are delocalized. OK, so that

is why methylamine will be stronger base than

Aniline which we have seen earlier, because in the case

of Aniline the lone pairs are in resonance. So these

lone pairs are localized.

And therefore this will be a

stronger base. These Are the references.

Thank you.