Welcome students to this module of e-learning. I, Dr. Maria A. D'Souza Assistant Professor,St. Xavier's College would like to present to you this module to the students of Bachelor of Science first year botany generic elective paper. Semester one paper code BoG101 and the paper titled Environmental Biotechnology.

I will present you the module #21. Module name organic substituted simple aromatic compounds and polyaromatic hydrocarbons under the unit for xenobiotic compounds.

The outline of the module will be definition properties of aromatic cabcom compounds.

Types examples of substituted aromatic compounds.Definition characteristics, examples, sources, and effects of polyaromatic hydrocarbons.

Once the student goes through this module, the learning outcomes, he will be able to describe cite examples of substituted simple aromatic compounds and polyaromatic hydrocarbons. Explain the characteristics, sources, effects of polyaromatic hydrocarbons on the environment.

Now aromatic compounds a simple aromatic rings. Simple arenes simple aromatics. They're known by various names, and once they undergo a substitution reaction,they form substituted simple aromatic compounds. Now to define aromatic compounds, the unsaturated hydrocarbon ring structures which have one or more planar 6 carbon rings,called benzene rings to which hydrogen atoms are attached with the general formula CnHn. The exhibit fragrant properties and also unusual stability due to their Aromacity.

The simplest aromatic compound is benzene, which is the parent compound. And from this when you have a substituent on that, it is always prefixed to the benzene. Now these aromatic compounds are named based on the Number and type of substitutents on the ring, Now let's see the first one, monosubstituted benzene. That means in these aromatic compounds we have a single substituent. Now,benzene, whose only one hydrogen Atom is replaced by an alkyl or functional group. Now, if this substituent contains 6 or fewer carbons, it is called as monosubstituted benzenes.

Examples. Chlorobenzene Cl is added in the replacement of hydrogen. Then we have Nitrobenzene and then bromobenzene.

Then we have methylbenzene ethylbenzene. When propyl group is attached it is propyl benzene.

These are monosubstituted benzene compounds and if the substituent contains more than six carbons, like in this case we have 1 phenyl octane.

But if you have an alkyl group attached or linked to the as a functional group to the benzene parent compound, we have benzyl alcohol.

Many monosubstituted benzenes have common names like to Toluene, which is actually methylbenzene, but it is known very much by this common name toluene. Then we know about phenol, it is actually hydroxy benzene.

Aniline is amino benzene.

We have benzoic acid is Anisole.

Now we go to the disubstituted benzene. These aromatic compounds are with multiple substituent's. Benzene, whose two hydrogen atoms are replaced by an alkyl or a functional group, and in this case the ring atoms, will be numbered.

Now there are different ways.There are three ways actually two groups can be attached to a benzene rings, so a prefix

of ortho, meta or para can be used to designate the relative

position of the two substitutes.For example, we have two bromine

attached here, so it is called as 1,2-dibromobenzene.

Then you have again to attach but in different positions. So

we call it 1/3 dibromo benzene.

Then we have 1/4 dibromobenzene.

With this we come to the end of the first part of our module

will go to the second part,which is polyaromatic

hydrocarbons, commonly called us
PAH. Also known as other names like polycyclic aromatic

hydrocarbons, polynuclear aromatic hydrocarbons. Now, what

are these? Let us define them.

They are a large group of organic compounds containing

only carbon and hydrogen. There are composed of two or more

fused aromatic rings that share carbon carbon bones.

Approximately 10,000 compounds are known that are water,

atmospheric and soil pollutants.

Coming to the characteristics of polyaromatic hydrocarbons.

They are molecules with two or more fused 6 carbon Atom

aromatic rings. Only hydrogen and carbon are present.

They are uncharged nonpolar molecules. They have a low

solubility in water, but are highly lipophilic.

Very important characteristic in these compounds is this higher

the number of benzene ring, the PAH has a higher molecular weight

but lower the solubility in water. So as the number of

benzene rings get added, the molecular weight increases, but

there is solubility in water decreases, they react with

pollutants such as ozone,nitrogen oxides, sulfur dioxide,

Yielding diones, nitro and dinitro polyaromatic hydrocarbons and sulfonic acids.

These are some of the examples we have. Benzene, naphthalene,

anthracene, phenanthrene,pyrene, benzopyrene, coronene,

Triphenylene. Now these only arose arising from the parent

compound which is benzene.

The first and the simplest polycyclic aromatic compound is

naphthalene. Having two aromatic

rings. It is relatively

volatile. Soluble and

degradable. An important item in the production of mothballs.

Then we have phenanthrene as you see in the picture. It's a it's

having three benzene rings. It's high molecular weight compared

to the other compounds that you saw, and it's used in the

synthesis of drugs, dyes and explosives. We have pyrene having

four benzene rings and forms during incomplete combustion of

organic compounds. And it has been commercially used to make

dyes and dye precursors.

Then we have Benzo E Pyrene. Having five benzene rings and it is found mostly

in cigarette smoke and it is produced by the incomplete oxidation of organic compounds in tobacco.

When ingested or inhaled are oxidized to

carcinogenic products.

Now the sources of polyaromatic

hydrocarbons. They are ubiquitous.

found everywhere persistent environmental, organic

contaminants generated from either natural or man made or

thermal in combustion.

Thermal incomplete combustion of organic

matter.

You will also find PAH in high temperature cooking, such as

grilling, smoked fish. Burnttoast will also form pH in meat

and other foods.

Burning coal oil tar deposits,crude oil, gasoline, trash, wood

tobacco. No cigarette smoke or when biomass burns and forest

fires. Also, and combustion of other biofuels such as

dung or crop residues,thermal decomposition of

organic matter in engines,an incident eighters.

It is a very important source from emissions from vehicles

such as cars and trucks.

Not a lot of effects of these polyaromatic hydrocarbons. Let's

see them one by one. It is released into the environment.

They tend to remain in the surface soil and do not migrate

in groundwater except in case of

naphthalene. These compounds are set to be pollutants may also

be degraded by some microorganisms in the soil.

Now this is a very important as I mentioned to you earlier. The

higher ringed PAH acquired resistance because they have a

low solubility in water.

And they are resistant to by degradation due to the

complexity and very low

solubility. They are considered hazardous due to cytotoxic, muta

Genic and carcinogenic effect.

Cancer is the primary human health risk.

Exposure to PAH has also been linked with cardiovascular

diseases and poor fetal

development. These are the references students.

These are the web links.

Thank you students for a patient hearing.