



Department of Chemistry

October, 2024

CHEMINFO

(Volume-II) Newsletter by Department of Chemistry Session 2024-25



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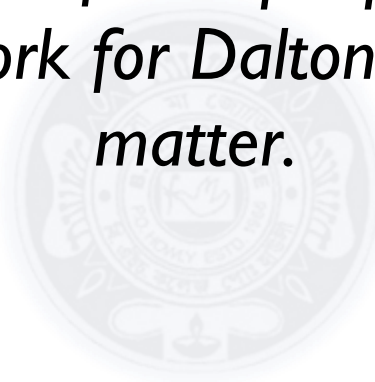
Students of Chemistry department

A special thanks to the faculty of Chemistry department.



A brief history of Chemistry:

Chemistry took its present scientific form in the 18th century when careful quantitative experiments by Lavoisier proust and Dalton resulted in the law of define proportions, the law of conservation of mass, and the law of multiple proportions, which laid the groundwork for Daltons atomic theory of matter.





Principal's Column:

I am very glad to know that the department of Chemistry is coming up with its second volume of newsletter "Cheminfo" for the session 2024-25. The newsletter contains few selected articles on chemical science. This sort of newsletter can be used to highlight the exciting Chemistry and family atmosphere within a Chemistry department.



Dr. Bushan Chandra Pathak
Principal, B.H College



Omme Sadika

Synthetic organic chemistry, the art of molecule construction:

Synthetic organic chemistry is a specialized branch of chemistry focused on the construction of organic molecules through deliberate and controlled chemical reactions. This field plays a critical role in the development of new materials, pharmaceuticals and agrochemicals, contributing to advancements in various industries and improving quality of life.

The process of synthetic organic chemistry involves designing and executing sequences of chemical reactions to build complex molecules from simpler starting materials. Chemists employ a wide array of techniques including catalysis, reagent design and reaction optimization to achieve the desired transformations with high precision and efficiency. These methods allow for the creation of molecules with specific structures and functions which are often not found in nature.

One of the significant achievements in synthetic organic chemistry is the total synthesis of natural products which are complex molecules typically produced by living organisms. The ability to synthesize these molecules in the laboratory not only provides insight into their biological functions but also enables the production of large quantities for research and therapeutic purposes.

Moreover, synthetic organic chemistry is instrumental in drug discovery. By designing and synthesizing new compounds, chemists can create potential drug candidates that are then tested for their efficacy in treating diseases. This field continues to evolve with innovations in green chemistry and automated synthesis promising to make the process more sustainable and accessible.

In essence, synthetic organic chemistry is a powerful tool that allow scientists to manipulate the building blocks of life, leading to ground breaking discoveries and innovations across various fields.



Pankaj Saha

Corresponding author: Rajib Saha (B. pharma)

Biodegradable polymer's enhancing novel drug delivery system:

1.1. A lot of polymers are employed in medication delivery because of their surface and bulk characteristics. The goal of this study is to extend the effectiveness of various drug delivery system. Due to its durability and capacity for self-transformation as an excipient in tablet and capsule formulations, polymer plays a crucial role in the administration of new drugs. Polymer is used in drug –targeting and different drug – release system. Biodegradable and non-biodegradable polymers are categorised in his way. The polyester family of synthetic biodegradable polymers, such as PGA (polylactic acid), polyglycolic acid (PGA), and its copolymers, such as PGLA are the most commonly utilized. The fundamental drawback of commonly used biodegradable polymers like polydioxanones and hydroxy acids is that they are too stiff and unyielding, which prevents them from undergoing reversible deformation. In several laboratories in India, the development of drug delivery system for pharmaceuticals is being undertaken with enthusiasm.

1.2. Biodegradable polymers in different dosage forms:

Polymers have helped in advanced drug delivery technology by allowing for the controlled release of therapeutic agents in constant dose over long period of time, cyclic dosage and tuneable release of both hydrophilic and hydrophobic drugs. Biodegradable polymer used in different dosage form (tablet, capsule, and extended) for enhancing their therapeutic effect as well as the release of the drug.

1.3. Polymers play different roles in the design of pharmaceutical dosage forms.

- **Tablets:** Polymers including Polyvinyl pyrrolidone and Hydroxy propyl Methyl Cellulose (HPMC) are found to be good binder which increases the formulation of granules





that improves the tablet. Enteric coating compounds include hydroxypropyl methyl cellulose phthalate (HPMCP), polyvinyl acetate phthalate, polyvinyl acetate phthalate.

- **Capsules:** Many of the polymeric excipients used to bulk up capsule fills are also found in intermediate release tablets. By recent advances HPMC has been accepted as alternative material for hard and soft capsules.



Extended –release dosage forms:

Extended and sustained release dosage forms prolong the time that systemic drug levels are within therapeutic range. Water soluble polymers for extended- release applications are the ammonium methacrylate copolymers cellulose derivatives ethyl cellulose, polyvinyl derivative, polyvinyl acetate.

1.4. Recent development of polymer uses for NDDS:

Chitosan has recently become popular for the creation of innovative multi-particulate systems and has had excellent success in enhancing bioavailability through alternative dosage forms. There are still extremely few examples of chitosan microspheres floating. The most popular and often employed polymers are EC, HPMC and Eudragit. It is now possible to close this gap because to recent developments in the synthesis of new biomaterials and our understanding of biological processes. Among all the routes that have been used for the systemic distribution of drugs via diverse pharmaceutical products of varied dose forms, oral drug delivery has long been recognized as the most popular. The oral route's success may be somewhat related to how simple it is to administer. Numerous polymers, both natural and synthetic, have been investigated for potential use in medication delivery. Best thing about synthetic polymers is readily available and have useful qualities. Polyvinylpyrrolidone and polyethylene glycol acrylate-based hydrogels are two promising synthetic polymers that have been created for biomedical purposes. PLGA polymers with more hydrophobic end caps degrade more quickly than those with carboxyl ends.

1.5. CONCLUSION:

A new development in the formulation of new drug delivery systems that enhance therapy and treatment is made possible by polymers. In-depth research in the fields of chemistry and biomedical polymers will also be necessary for the development of novel medical and World Journal of Pharmacy and Pharmaceutical Sciences pharmaceutical specimens. Increasing interest has also been dedicated to the polymers containing natural compounds in macromolecules that have been incorporated into though the polymerization process. Polymers are used in the



conventional dosage forms like binders for enteric coted tablets which mask the unpleasant taste, viscosity enhancers for controlling flow in liquids, gel preparation in case of semisolids and also used in preparation of transdermal patches.



Happily Narzary

Chemistry of food additives and preservatives:

The practice of preserving foods and improving their properties has been known for millennia. Sugar and salt are typical examples, the first is a very common sweetener while the second not only improves the flavor but also preserves food for long periods. Over the years many more chemicals have been used as food additives.

It is evident how chemistry plays a crucial role in food industry, enabling the exploitation of several useful functions. Additives used in foods serve as a various purpose such as enhancing quality and test, improving nutritional value, and increasing storage ability.

Common additives are: -

Preservatives: Maintain freshness, prevent food spoilage and changes in flavor or texture.

Sweeteners: For added sweeteners with or without calories.

Colors: Prevent color loss due to exposure to environment, enhance natural color, provide color to colorless foods.

Flavors: Add a specific flavor.

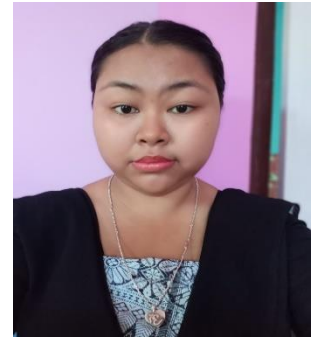
Nutrients: Replace vitamins and minerals lost in processing, add nutrients lacking in diet.

Chemical preservatives are fundamental in tackling food spoilage. Depending on their target and mechanism of action preservatives can be antibacterial, antioxidants and some chemicals target enzymes in food itself.

Despite the many benefits and effectiveness in their functions there are concerns for some preservatives on both human health and environmental impact, with some studies reporting risks for humans and animals. There is therefore a growing demand for natural alternatives while keeping the same standard in terms of food safety and efficiency.



Humans have always reported to chemistry to help in preserving and improving the properties of foods. Over the years, an increasing number of alternatives have become available, particularly considering large-scale food production, long term preservation and aesthetics.



Bwhwithi Daimary

Roles of perfumes in cosmetics:

Cosmetics and personal care products are applied to the human for the purposes of beautifying, cleaning, protecting and change the appearance of external parts of the bodies. Ranging from antiperspirants, fragrances, make-up and shampoos, sunscreen and toothpastes, cosmetics and personal care products play a very essential role in all stages of our life.

Cosmetics are composed of a mixture of a chemical compound obtained from either natural or synthetic sources. Cosmetics have purposes including personal and skin care. They can be used to conceal blemishes and enhance natural features.

Perfumes are the one of the major parts of the cosmetic products. Perfume is a type of compound that contains a fragrance to appeal to the senses. They are often made with synthetic aroma compounds or natural essential oils which are diluted with a carrier such as vegetable oil, mineral oil or propylene glycol. These ingredients can create a scent and add with it a personal touch to use in various products. The most common type of fragrance oil is the cologne base.



Perfume is used to give a pleasant and desirable scent to a person's body, typically with goal of increasing self-appeal and self-confidence. Scents are reported to enhance health and well-being by improving mood, reducing anxiety and stress, increasing cognitive function and improving sleep. It also makes a positive effect on mind in front of people and interact with them.

Flower fragrances make feel most feminine and attractive. The process of manufacturing scents is very manifesting. The unique fragrances of flowers are the reason they are used in creating a refreshing scent in the perfume industry. For example: -



Rose: Rose flower is one of the main ingredients of many floral perfumes often used by people. Rose is always harvested at night as during nights they carry a strong smell before the sunrise. Rosa Centifolia and Rosa Damascene found in the south of France and Arab countries are the most common species of roses using in making perfumes.



Plumeria: Plumeria is considered to be the strongest scent among all the floral fragrances available, which makes it the essential and fundamental ingredients of several perfumes. Plumeria flowers are mainly found in central America and Mexico.

Lavenders: Lavenders are sweet smelling flowers which are used for several purposes ranging from making perfumes to medicinal uses. It also has antibacterial and antifungal effects. These flowers are found across the Canary Islands, south Europe, Arabia and India. It has a very different fragrances that combines 180 constituents and is widely used in perfume industry.

Perfumes have the remarkable ability to transport us to different places and evoke a wide range of emotions through their captivating scents. Perfumes have an undeniable power that impact us and the people we interact with. Oil-based perfumes are more effective and give more coverage, so it's best to use an oil-based perfume. It's safe to apply them in the skin. This will help to avoid any allergic reactions and keep the fragrance long lasting. Perfumes also have negative impacts of fragrance on human health includes allergic reaction cutaneous, respiratory and systemic effect like headache, asthma attack etc.

Perfume plays a very important role in the world of cosmetics. Its fundamental purpose is enhancing an individual's natural aroma, while also giving personal products a sensory feel that is meant to leave a lasting and pleasant impression.



Ayush Saha

Chemistry In Everyday Life:

INTRODUCTION:

The word chemistry makes us think of chemicals, beakers, test tubes, burners and an evil scientist working on a power potion. Everything you hear, see, smell, taste and touch involves chemistry and chemicals(matter). It is essential to know about chemistry at some level to understand the world around us.

LIST OF EXAMPLES OF APPLICATIONS OF CHEMISTRY IN EVERYDAY LIFE:

The Composition of The Human Body:

Human body is made of millions of compounds. We don't even know them all. All these chemical compounds are a combination of a few constituent elements such as carbon, hydrogen, nitrogen, oxygen, calcium, phosphorus, sulphur etc.

Emotional Chemistry:

This is not about chemistry that makes you emotional. There are biochemical compounds that control your mood. The emotions a human feel depends on the hormones his brain releases. Your body shows stress due to accumulation of certain compounds called cortisol. You feel happy when your body releases endorphins, dopamine, serotonin and oxytocin.

The Food You Eat:

The bread you eat is fluffier and softer than before. Cereals, fruits, fish, chicken and other staple foods you eat with proper condiments and ingredients. All these ingredients are prepared by following various chemical processes.

Hygiene:



Soap which we use to wash our body. The formation of soap takes place through the process of saponification. The soap molecules form micelles in water that can grab the dirt and loosen it from the surface. So, when you wash your hands or clothes the same thing happens.

Shedding tears when cutting onion: You might have seen people crying while cutting onions. There is a wonderful chemistry mystery waiting to unravel. When you slice an onion, Sulphonic acid is formed from the amino acid sulfoxide compounds present in it. This acid produces a volatile gas called propanediol s-oxide. It causes our eyes to shed tears by stimulating the tear glands.



Rusting: Chemistry is not always helpful. For instance, industries suffer use losses all the time due to rusting. Rust is a brown unstable substance formed on iron instruments and infrastructure when iron reacts with oxygen in presence of water vapour. Also, we use anti rust paint to cover the iron part and to stop rust from progressing.



Conclusion: Chemistry is not only limited to beakers and laboratories. It is all around us, and the better we know chemistry, the better we know our world.



Samima Khatun

The chemistry of Indian cooking masala:

Unlocking the secrets of flavour, Indian cuisine is known for its rich and complex flavours, which we much of their depth to the use of spices, or masalas. Masala blends various spices, is at the heart of Indian cooking, transforming simple ingredients into vibrant, aromatic dishes.



But beyond the art of blending spices lies the chemistry that gives these spices their distinctive flavours, aromas and health benefits.

Let's dive into Indian cooking masala and how it plays a crucial role in creating the unique taste of Indian cuisine.



I. The chemistry of spice components: spices used in Indian masala brings its own set up chemical compounds that contribute to the overall flavour and Aroma of a dish. Here, some key spices and their chemical components.

◆ **Turmeric:** The golden hue of turmeric comes from curcumin, a compound known for its anti-inflammatory properties. Curcumin contributes to the earthy, slightly, bitter flavour of turmeric and is responsible for its vibrant colour.

◆ **Cumin:** Cumin seeds contain cumin aldehyde which gives them their warm, slightly spicy aroma. This compound also contributes to cumin's distinctive earthy, nutty flavours.

◆ **Coriander:** Coriander seeds contain Linalool a compound with sweet, literacy aroma. Linalool contributes to the fresh, lemony flavour coriander, which balances out of the warmth of other spices

◆ **Cloves:** Cloves are rich in eugenol, a compound with a strong, sweet spicy Aroma and slight numbing effect on the tongue. Eugenol is also responsible for cloves' antibacterial and antioxidant properties.



◆ **Cinnamon:** The sweet, Woody flavour of cinnamon is come from cinnamaldehyde a compound that also has antimicrobial properties. Cinnamaldehyde gives cinnamon its warming sensation and is often used to add depth to both sweet and savoury dishes.

◆ **Cardamon:** Cardamon's distinct flavour is due to terpenes such as cineole and alpha-terpinol acetate which contribute to its sweet, floral Aroma slightly minty citrusy taste.

The chemical compounds not only define the flavour, profane of each spice but also interact with each other when combined in a masala, creating complex layers of taste and Aroma.

2. The role of heat in releasing flavours: Heat plays a crucial role in the chemistry of cooking masala. When spices are heated, their essential oils where most of the flavour compounds are concentrated are released, enhancing the overall flavour of the dish. This is why many Indian recipes begin by testing whole spices in oil, a process known as tempering or "Tadka". During tempering, the heat causes the essential oils to evaporate and infuse the cooking oil with flavour. The oil then acts as a carrier, spreading the flavour throughout the dish.

3.The health benefits of masala: Many of the spices used in Indian masala are not just flavourful, they also offer significant health benefits, thanks to their bioactive compounds.

◆ **Turmeric:** Curcumin has powerful anti-inflammatory and antioxidant effect, and is being studied for its potential in preventing and treating various disease, including cancer and Alzheimer's.

◆ **Ginger:** Gingerol, the active compound in Ginger, has and the inflammatory and antioxidant properties, and can help with digestion and reducing nausea.

◆ **Garlic:** Allicin, the compound responsible for garlic's pungent smell, has antibacterial and antiviral properties, and can support health by lowering blood pressure and cholesterol levels.

◆ **Cinnamon:** Cinnamaldehyde, has been shown to have Anti diabetic effects, helping to regulate blood sugar levels.



Recent activities and achievements

Department of Chemistry:



Chief guest at St. Mary's High School for Science exhibition



Extended the service as an external evaluator in Gunotsav, 2024 at Bilasipara Pathar primary school.



Extended the service as an External Evaluator in Gunotsav (5th Round),2024 at Gobardhan H.S School and two other schools (one ME school and the other L.P School) in the same locality under Dist.-Bajali (Assam) from 4th to 6th January,2024.



Election duty as master trainer at Bajali district.



Assam Gunotsav duty as external evaluator.



Delivered a speech as a guest lecturer at Barnagar College on Science Day.



Attended a seminar in B.B.K College for practical exam of 6th semester.

Faculty achievement:

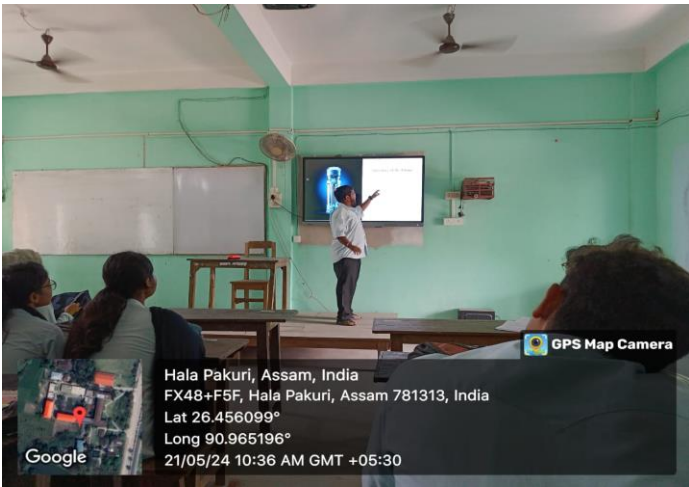
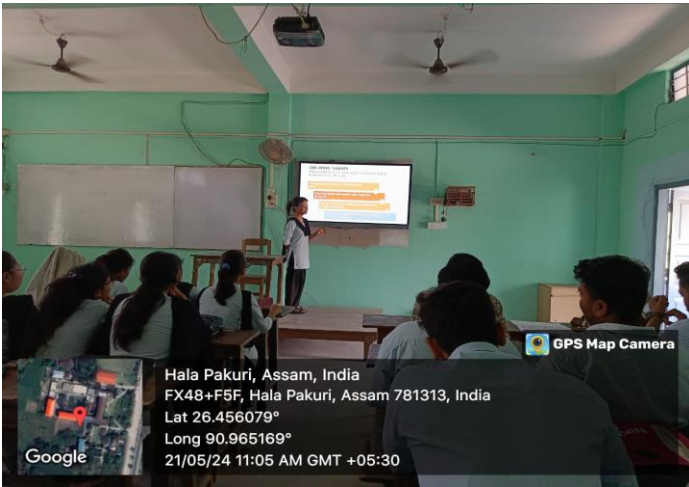
Praphat Chandra Choudhury and Dhiraj Kumar Sarma both joined PhD course at Bhattadev University.



Departmental activities:



Teachers' day celebration 2023.



Departmental seminar programme.



Departmental farewell batch 2021-24.



ALUMNI MEET

Department of Chemistry.



Departmental picnic to Daragaon (2024).



Nobel prize winners of Chemistry:



Jacobus Henricus van 't Hoff

A founder of physical chemistry, he formulated the osmotic pressure law and was important in stereochemistry.



Emil Fischer

Known for his work on the synthesis of carbohydrates and purines, he discovered phenyl hydrazine.



Svante Arrhenius

A founder of physical chemistry, he was the first Swedish Nobel laureate in Chemistry in 1903.



Sir William Ramsay

Britain's first recipient of the Nobel prize in Chemistry in 1904, he discovered the noble gases.



Adolf von Baeyer

A contributor to the development of organic Chemistry, he founded what became the Bayer Chemical Co.



Henri Moissan

He won the Nobel prize in Chemistry in 1906 for his work on fluorine, including the discovery of a diamond-like mineral.