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FROM THE HOD'S DESK

The Department of Chemistry is happy and proud in bringing out the 18th issue of the periodical CHRYSL - Chemistry Resonating in Young Students' Lives. It gives me a great sense of satisfaction and joy that the reading and writing skills of the students have been utilized and writings in the form of research articles, essays, riddles, drawings, quizzes, etc. have been published.

At this juncture, I remember with gratitude and love the enormous amount of work done by the former Heads and faculty members to bring out the potential of the chemistry students and to give academic inputs by organizing international and national seminars, release of conference proceedings and especially CHRYSL which is an initiative that helps the students to give life to their thoughts and emotions on chemistry.

These days, when students spend their time in digital reading, people may think that the trend of releasing such a book is old-fashioned, but I strongly believe that every effort taken by every student sow a seed in developing herself as a great thinker and leader for the future. This issue and the content speak volume of the time and hard work put in by the contributors as well as the editors,Dr.V.Sugantha Kumari and Dr. E. Radha, Assistant Professors of Chemistry, Auxilium College. I sincerely thank them for their consistent follow-up, editing, and publishing. My congratulations to the budding authors and the faculty members of our department who always collaborate and cooperate with me in every task. Let the unswerving conviction and lifelong dedication of the staff continue.

Dr. S. Jhancy Mary
Asso.Prof. & Head
PG and Research Dept. of Chemistry
Auxilium College

Editorial

Greetings and a warm welcome to Volume XVIII of CHRYSL (Chemistry Resonating in Young Students' Lives), the annual periodical of the Department of Chemistry.

'Imagination is the beginning of creation. You imagine what you desire, you will what you imagine and at last you create what you will'- George Bernard Shaw.

CHRYSL magazine marks the growth, unfolds the imagination of the students and gives life to the thoughts and aspirations. It unleashes a wide spectrum of creative skills ranging from writing to editing. CHRYSL magazine is a platform for students to showcase their creative abilities through articles, poetry, painting, pencil drawing etc. This magazine has been nurturing young minds for the past 18 years with the belief that "Creativity is seeing the same thing but thinking differently".

We gratefully acknowledge our sincere gratitude to our beloved Principal Dr. (Sr.)Jaya Santhi.R for her support and motivation. We place on record our deep sense of gratitude to Dr. S. Jhancy Mary, Head, PG and Research Department of Chemistry for her valuable suggestions, unstinted support and guidance. We express our thanks to all the staff and students of the department for their contribution.

Thank you all. Enjoy reading.

Dr. V. Sugantha Kumari
Assistant Professor of Chemistry
&
Dr. E. Radha
Assistant Professor of Chemistry

CHOCOLATE - THE SWEET LURE OF CHEMISTRY

In the world, one of the most popular food types is chocolate. Just the word juggles up mouthwatering, deliciously tempting goodness. Chocolate is made from beans derived from the cacao tree. These beans are very bitter. Though many think chocolates as unhealthy candies which would ruin our teeth or make them obese and of course cause diabetes, yet people unfailingly fall for chocolates. Not only that people crave for this sugary goodness but many events mark its start and end by sharing chocolates which puts a big wide smile on people's face. Chocolate contains 300-500 known chemicals some of which react within the human brain to alter mood. Out of these many chemicals, the chemicals that a play major role in human are Phenyl ethylamine, Caffeine, Theo bromine and Serotonin.

Phenyl ethylamine (PEA) is an alkaloid, which acts as a central nervous system stimulant in humans by producing dopamine. Chocolate naturally contains caffeine which contributes to energy boost. Theobromine is a primary alcohol, which has comparatively greater stimulating power than caffeine and is able to block inhibitory neurotransmitters. Serotonin is derived from tryptophan, which is the body's chemical messenger that promotes feelings of well-being and elation.

IRENE KEREN. M
III B.Sc. CHEMISTRY

3D PRINTING NANOTECHNOLOGY IN TOUCAN BIRD

National bird of Brazil is sulfur- breasted toucan or rainbow-billed toucan. Brazil is one of the noted countries that use 3D printing technology in the medical field mainly for animals. Using photogrammetric method, technicians were able to replicate the portion of the peak that was lost by a toucan bird and then turned it into 3D model. Using special modelling software, the beak was able to be hollowed and manipulated by 3D printing on a FDF\FFF based 3d printer made out of PLA plastic (nylon). After the surgery, the bird was right back to eat normally again allowing him to lead an ordinary life.

Nylon 3D Printing

Nylon was first synthesized by Dupont, the American chemical company, in 1935. Nylon refers to a group of plastics known as polyamides. They are mostly semi-crystalline and generally very tough materials. It is found in many variants but most common ones are Nylon 6, Nylon 6-6, and Nylon 12. It is a thermoplastic material. This is widely used in automotive industries and some common composites used in 3D printing are glass -filled and carbon filled nylon.

Apart from the advantages, nylon has some major drawbacks that can often hamper its printing performance hygroscopicity This property is detrimental in delivering predictable performance. But this same property helps nylon in easy post processing with fabric dyes and spray paints thereby making it suitable for use in the printing of aesthetic models. There are successful cases of patients injured in road accidents who have been treated and helped with rebuilt 3D printed titanium parts.

SNEHA. S
I M.Sc. CHEMISTRY

SMART CHEMISTRY

It is hard to believe that 20 years ago, hardly anyone even owned a cell phone and now the cell phone has morphed into something bigger and better. Worldwide, more than one billion smartphones were purchased last year. If you own a smartphone, you are probably aware that in a year or two, it will be practically obsolete, because the smartphone just keeps getting smarter. When you use your smartphone you are putting chemistry into action. If you are wondering what chemistry has to do with smartphones, just look at the periodic table. Of the 83 stable (nonradioactive) elements, at least 70 of them can be found in smartphones, that is 84% of all of the stable elements.

Metals are what make smartphones so "smart." An average smartphone may contain up to 62 different types of metals. One rather obscure group of metals, the rare-earth metals play a vital role. These rare-earth metals include scandium and yttrium, as well as elements 57-71. Elements 57-71 are known as the lanthanides, because they begin with the element lanthanum. The lanthanides often appear as the first of two free-floating rows located at the bottom of the periodic table. Scandium and Yttrium are included in the rare-earth metals because their chemical properties are similar to those of the lanthanides.

A single iPhone contains eight different rare-earth metals. If you examine several varieties of smartphones, you can find 16 of the 17 rare earth metals. The only one you will not find is promethium, which is radioactive.

Display

This toughness is actually the result of a serendipitous accident. In 1952, a chemist at Corning Glass Works was trying to heat a sample of glass to 600 °C in a furnace when a faulty thermostat caused it to be heated to 900 °C. Upon opening the door, he was glad and surprised to find that his glass sample was not a melted pile and that it had not ruined the furnace. When he took it out with tongs, he dropped it on the floor (another accident). But instead of breaking, it bounced!

Touchscreen

As every smartphone user knows, the screen on a smartphone is far more than just a tough piece of glass. It is a screen that responds to your touch aptly named a touchscreen giving you a personal connection to your phone. There are two basic categories of touch screens. The first category of touchscreens, called resistive touchscreens**,** can be touched with any type of material and they will still work. A pencil works just as well as a finger. You can activate the screen even if wearing gloves. Resistive touch screens are found in an automated teller machine (ATM) and at checkout counters in stores, where you sign your name for a credit purchase on the display screen.

Resistive touch screens are composed of two thin layers of conductive material under the surface. When you press down a resistive touch screen, it physically indents, causing the two layers to touch, completing the circuit and changing the electrical current at the point of contact. The software recognizes a change in the current at these coordinates and carries out the action that corresponds with that spot. Resistive touch screens are also known as pressure-sensitive screens, Only one button at a time can be pressed. If two or more buttons are pressed at once, the screen does not respond. Smartphones use the second basic category of touch screens, called capacitive touch screens which are electrical in nature. A capacitor is any device that stores electricity.

Battery

The majority of today's phones use lithium ion batteries. These batteries tend to use lithium cobalt oxide as the positive electrode in the battery (though other transition metals are sometimes used in place of cobalt), whilst the negative electrode is formed from carbon in the form of graphite. It will also have an organic solvent to act as the electrolytic fluid. The lithium in the positive electrode is ionised during charging of the battery, and moves into the layers of the graphite electrode. During discharge, the ions move back to the positive electrode. The battery itself is usually housed in an aluminium casing.

SHARMILA. D
II B.Sc. CHEMISTRY

A NEW ELECTROLYTE FOR GREENER AND SAFER BATTERIES

Lithium-ion batteries are introduced to the market in the early 1990s, which now power most of our electronic devices and electric vehicles. However, they have two major shortcomings. The liquid electrolyte they contain, which allows positive ions to flow between the two electrodes of the battery, is highly flammable. If it leaks, it can react violently with oxygen, posing a major hazard to users. The supply of lithium is also problematic. Unevenly distributed around the globe, it is at the heart of major geopolitical issues in the same way as oil.

An alternative is sodium battery. This chemical element is abundant all over the earth and in the sea. It is more sustainable and cheaper than lithium. It is also easier to recycle. However, its use is still underdeveloped. The production of this type of batteries involves a different technology from that used for lithium-based ones. The only problem is that its ions do not move easily in the liquid electrolyte of conventional batteries, making it less efficient than lithium. Therefore, the solution lies in the development of a solid electrolyte.

A scientific team from the University of Geneva (UNIGE) has succeeded in meeting this challenge by modifying the crystal structure of a material composed of carbon, boron and hydrogen (carbo-hydridoborate) and developed an efficient material called sodium carbo-hydridoborate. Originally, this material which is used in nuclear medicine is not conductive. By modifying the structure of its crystals, and more precisely the spatial arrangement of the atoms, the team has succeeded in making it conductive, which makes it the most efficient means of transporting sodium ions currently available. To achieve this result, the research team subjected the compound to high shocks, generating high temperatures, inside a ball mill. For a battery to work, the electrolyte, whether liquid or solid, must be in intimate contact with the positive and negative electrodes of the battery and It must therefore be contained firmly within the battery. To achieve that, pressure must be applied. The research group also defined the ideal pressure to be applied to the battery for it to operate efficiently.

SHANMUGA PRIYA. V
Ph.D RESEARCH SCHOLAR

Jacques Charles formulated the Charles's law

SHAKKINA. S
I B.Sc. CHEMISTRY

HAND SANITIZER

What is in a hand sanitizer?

Hand sanitizers come in two varieties. They are alcohol based and non-alcohol based. Alcohol-based sanitizers contain 60-95% alcohol. Most contain ethanol, n-propanol, isopropanol or a combination of these. Some hand sanitizers also contain chlorohexidine or Benzalkonium chloride, glycerol and hydrogen peroxide. Glycerol stop your hands from drying out and hydrogen peroxide added in small amount prevent bacterial contamination in hand sanitizers.

How do hand sanitizers work?

Alcohols in hand sanitizers are effective at killing bacteria and viruses. They affect the structure of proteins, causing them to become 'denatured' and they destroy the cell wall and membranes of bacterial cells and the envelop of viruses. They are leseffective against non-enveloped viruses. Non-alcohol based sanitizers also kill bacteria but are less effective against viruses.

How effective are they?

Hand sanitizers with >60% alcohols are effective if applied. However, they don't kill all virus types and are less effective on dirty or greasy hands.

THILAKESWARI. K
III B.Sc. CHEMISTRY

CHEMISTRY IN HYGIENE

"Did you wash your hands?" is now the frequently asked question. As the world is affected by COVID-19, doctors highly recommend people to wash hands frequently. How washing hands help prevent the spread of deadly disease? As COVID-19 is spreading faster, the demand for cleansing soap and sanitizers raised.

Now the question arises how chemistry plays an important role in hygiene? The cleansing action is based on its ability to act as an emulsifying agent, soap traps dirt and fragments of the destroyed virus in tiny bubbles called Micelles, which wash away in water. In tandem, cleansing soaps and sanitizer disrupt the chemical bonds that allow bacteria, virus and grime to stick to surfaces, lifting them off the skin.

Chemistry plays an important role in hygiene from manufacturing disinfectant to kill the germs. Chemistry is the study of composition, properties and reaction in matter. Through Chemistry we can create new substances that improve health and sanitation. Which is more effective? Soaps or hand sanitizers? Washing your hands using soap and water is not possible every time. If gets difficult to maintain hygiene especially when you are travelling or too busy to leave your place.

Having a hand sanitizer is always a smart and handy option but scientists say that soap is more effective in removing chemicals and all kinds of germs including Corona virus and other infectious diseases. Sanitizers can disinfect only if it has at least 60% alcohol.

Moreover, hand sanitizers cannot clean thoroughly if too little is applied or it is wiped off before it has dried completely. On the other hand, soaps are very effective at destroying the surface membranes of some bacteria and virus, creates friction that helps lift and wash away dirt, grease and microbes under the running water.

Products processes and technologies that many of us take for granted today like clean drinking water, pasteurization and vaccines began as breakthroughs in chemistry. Chemistry forms a large part of our daily life and it plays a very important role in our lives.

NANDHINI. P
I B.Sc. CHEMISTRY

CHEMISTRY IN LIFE

I WANT TO STUDY CHEMISTRY
TO MAKE MY LIFE EASIER AND FASTER.
TO EXPLORE THEIR USES
TO SOLVE THE PROBLEMS OF MY PEOPLE
I LOVE TO STUDY CHEMISTRY.
IF I AM GIVEN A CHANCE TO STUDY
EVEN AFTER MY LIFE TIME
CHEMISTRY WILL BE THE ONLY COURSE.
MY PEN WILL ALWAYS WRITE
LIFE IS CHEMISTRY.

SHAKKINA. S
I B.Sc. CHEMISTRY

DID YOU KNOW?

- Fish scales are a common lipstick ingredient.
- Some lipstick contains lead acetate or sugar of lead. This toxic lead compound makes the lipstick taste sweet.
- The average shot of espresso contains less caffeine than a typical cup of coffee.
- Lemons contain more sugar than strawberries, for the same mass.
- Lobster blood is colourless until it is exposed to air? Then the blood appears blue.
- Goldfish eyes perceive not only the visible spectrum but also infrared and ultraviolet light.
- When you freeze salt water or seawater slowly, you get fresh water ice. Icebergs are fresh water, too, although that is because they come from glaciers, which are made from fresh water (snow.)
- If you expose a glass of water to space, it would boil rather than freeze. However, the water vapour would crystallize into ice afterward.
- Hydrofluoric acid is so corrosive that it can dissolve glass.
- Your tooth enamel is the hardest chemical substance in your body.

ATHEEBA FIRDOUSE. T
III B.Sc. CHEMISTRY

TEETH WHITENING

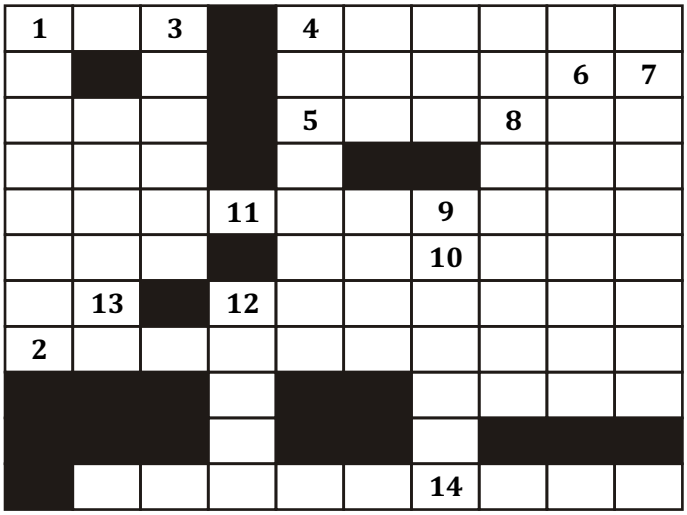
Most people would like to flash a smile of pearly whites, but over time teeth can become stained by foods, beverages and some medications. Unfortunately, the high levels of hydrogen peroxide in dentists' bleaching treatments can damage enamel and cause tooth sensitivity and gum irritation. Now, researchers have developed a gel that, when exposed to Near Infra Red (NIR) light, safely whitens teeth without the burn and this has been reported in ACS Applied Materials & Interfaces.

The growing demand for selfie-ready smiles has made tooth whitening one of the most popular dental procedures. Treatments at a dentist's office are effective, but they use high-concentration hydrogen peroxide (30-40%). Home bleaching products contain less peroxide (6-12%), but they usually require weeks of treatment and do not work as well. When a bleaching gel is applied to teeth, hydrogen peroxide and peroxide-derived reactive oxygen species (mainly the hydroxyl radical) degrade pigments in stains. The hydroxyl radical is much better at doing this than hydrogen peroxide itself, so researchers have tried to improve the bleaching capacity of low-concentration hydrogen peroxide by boosting the generation of powerful hydroxyl radicals. Because previous approaches have had limitations, Xingyu Hu, Li Xie, Weidong Tian and colleagues (2019) wanted to develop a safe, effective whitening gel containing a catalyst that, when exposed to NIR light, would convert low levels of hydrogen peroxide into abundant hydroxyl radicals.

The researchers made oxygen-deficient titania nanoparticles that catalyzed hydroxyl radical production from hydrogen peroxide. Exposing the nanoparticles to NIR light increased their catalytic activity, allowing them to completely bleach tooth samples stained with orange dye, tea or red dye within 2 hours. Then, the researchers made a gel containing the nanoparticles, a carbomer gel, and 12% hydrogen peroxide. They applied it to naturally stained tooth samples and treated them with NIR light for an hour. The gel bleached teeth just as well as a popular tooth whitening gel containing 40% hydrogen peroxide, with less damage to enamel. The nanoparticle system is highly promising for tooth bleaching and could also be extended to other biomedical applications.

FATHIMA RAMSHA. S
III B.Sc.CHEMISTRY

CROSSWORD PUZZLES



QUESTIONS:

Left to Right:

1. The another name of RDX is[10]
2. The monomer of polyethylene is [6]
5. The most malleable metal is [4]
11. The iron container is galvanized by [4]
14. What is 10^{6}? [4]

Right to Left:

7. The bond order of nitrogen molecule is [5]
10. Formic acid is found in [3]
14. The nuclear particles which are assumed to hold the nucleons together are [6]

Top to Bottom:

1. Tear gas is [8]
3. The first metal used by man was [6]
4. The brown coal is [7]
6. The important ore of iron is [8]
7. The filament of an electric bulb is made up of [8]
8. The hardest form of carbon is [7]
9. The most electropositive element is [7]
12. Poisonous metal is [4]

Bottom to Top:

13.The tendency of the elements to achieve noble gas configuration is called as an [5]

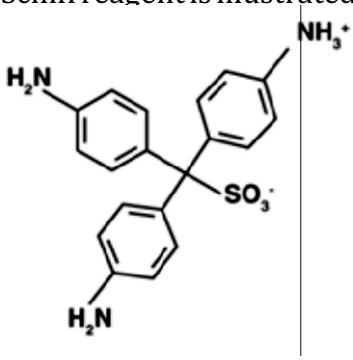
FOR ANSWERS TURN THE PAGE.

M. PRIYADHARSHINI
I M.Sc. CHEMISTRY

1 C	Y	3 C		4 L	O	N	I	T	E
H		O		I	E	E	R	6 H	7 T
L	T	P		5 G	O	L	8 D	E	U
O	E	P		N			I	M	N
R	T	E	11Z	I	N	9 C	A	A	G
I	C	R		T	N	10A	M	T	S
N	13O		12L	E		E	O	I	T
2 E	T	H	E	N	E	S	N	T	E
			A			I	D	E	N
			D			U			
	S	N	O	S	E	14M	E	G	A

SCHIFF'S TEST AND ITS APPLICATION

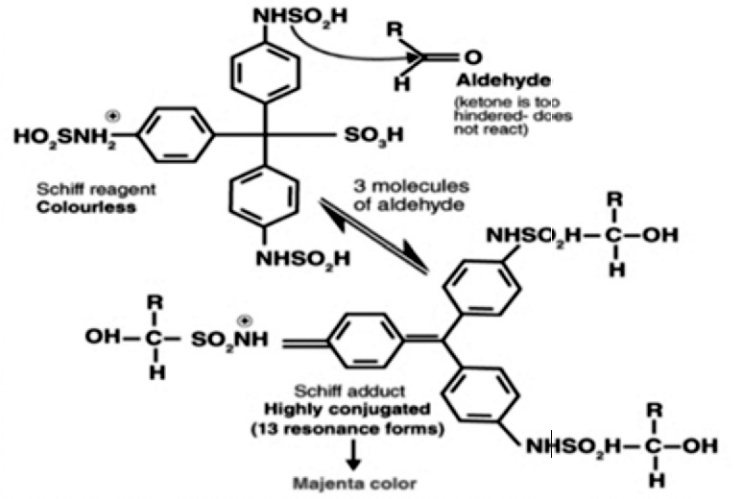
The Schiff test is a chemical test used to check the presence of aldehydes in a given substance. This is done by reacting the substance with a small quantity of a Schiff reagent. The structure of a decolourized Schiff reagent is illustrated below.



In this qualitative test for the aldehyde functional group, the development of a purple or magenta colour upon the addition of a few drops of the substance to the decolourized Schiff reagent confirms the presence of aldehydes.

SCHIFF TEST MECHANISM

The bisulfite and para-rosaniline react together to afford a decolourized adduct whose central carbon is sulfonated. Now, the free and uncharged amine groups belonging to the aromatic ring react with the aldehyde group to form



an aldimine. This aldimine group is an excellent electrophile and therefore undergoes further reaction with the bisulfite ion. Finally a purple or magenta coloured bisulfite adduct is formed.

SANOFAR. A & PAVITHRA. B
I M.Sc. CHEMISTRY

NOBEL PRIZE FOR CHEMISTRY 2021

Professor Göran K. Hansson, Secretary General of the Royal Swedish Academy of Sciences, on 6th October 2021 announced the Nobel Prize in Chemistry for the year 2021 to **Benjamin List and David W.C. Macmillan for the development of asymmetric organocatalysis.**

Organocatalysis has developed at an astounding speed since 2000. Benjamin List and David MacMillan remain leaders in the field, and have shown that organic catalysts can be used to drive multitudes of chemical reactions. Using these reactions, researchers can now more efficiently construct anything from new pharmaceuticals to molecules that can capture light in solar cells. In this way, organocatalysts are bringing the greatest benefit to humankind.

THE INVENTIONS & BACKGROUND OF THE LAUREATES

Benjamin List was born in 1968 in Frankfurt, Germany. He got his Ph.D. in 1997 from Goethe University Frankfurt, Germany. During his work with catalytic antibodies, Benjamin List started to think about how enzymes actually work. Benjamin List's out-of-

the-box question was: Do amino acids have to be part of an enzyme in order to catalyse a chemical reaction? Or could a single amino acid, or other similar simple molecules, do the same job? Finally he experimented and found that proline is an efficient catalyst, but also that this amino acid can drive asymmetric catalysis. Of the two possible mirror images, it was much more common for one of them to form than the other. Unlike the researchers who had previously tested proline as a catalyst, Benjamin List understood the enormous potential it could have. Compared to both metals and enzymes, proline is a dream tool for chemists. It is a very simple, cheap and environmentally-friendly molecule. When he published his discovery in February 2000, List described asymmetric catalysis with organic molecules as a new concept with many opportunities. The design and screening of these catalysts was one of the future aims. However, he was not alone in this. In a laboratory further north in California, David MacMillan was also working towards the same goal.

David MacMillan leaves sensitive metals behind...

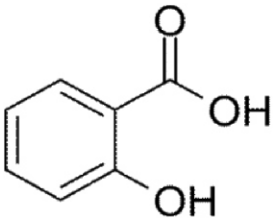
David W.C. MacMillan was born in 1968 in Bellshill, UK. He got his Ph.D. in 1996 from the University of California, Irvine, USA. David MacMillan started to design simple organic molecules which just like metals could temporarily provide or accommodate electrons. His knowledge of chemistry told him that for an organic molecule to catalyse the reaction he was interested in, it needed to be able to form an iminium ion. This contains a nitrogen atom, which has an inherent affinity for electrons.

He selected several organic molecules with the right properties, and then tested their ability to drive a Diels-Alder reaction, which chemists use to build rings of carbon atoms. Just as he had hoped and believed, it worked brilliantly. Some of the organic molecules were also excellent at asymmetric catalysis. Of two possible mirror images, one of them comprised more than 90 per cent of the product. David MacMillan gave his discovery the name organocatalysis. Finally, Benjamin List and David MacMillan succeeded in seeing past preconceptions to find an ingenious solution to a problem with which chemists had struggled for decades. Organocatalysts are thus bringing right now the greatest benefit to humankind.

Sr. MARY THERESA. S
I M.Sc. CHEMISTRY

MEDICINAL USES OF SALICYLIC ACID

Salicylic acid is a mono hydroxy benzoic acid that is benzoic acid with a hydroxy group at the ortho position that occurs as a natural compound in plants. It is obtained from the bark of the white willow and wintergreen leaves. It has a role as an antiinfective agent, an antifungal agent, a keratolytic drug, a plant metabolite, an algal metabolite and a plant hormone. It is a conjugate acid of a salicylate.



Structure of Salicylic acid

Salicylic acid esterified with methanol in the presence of an acid catalyst gives methyl salicylate, synthetic oil of wintergreen, which is used as a flavouring agent. Treatment of salicylic acid with phenol gives phenyl salicylate, which is used for sunburn creams and enteric-coated pills and to make salicylanilide for use as a fungicide and mildew preventive. Salicylic acid is a component of preparations used to combat warts, corns, calluses, and various skin diseases. The sodium salt is used in the manufacture of certain classes of dyes.

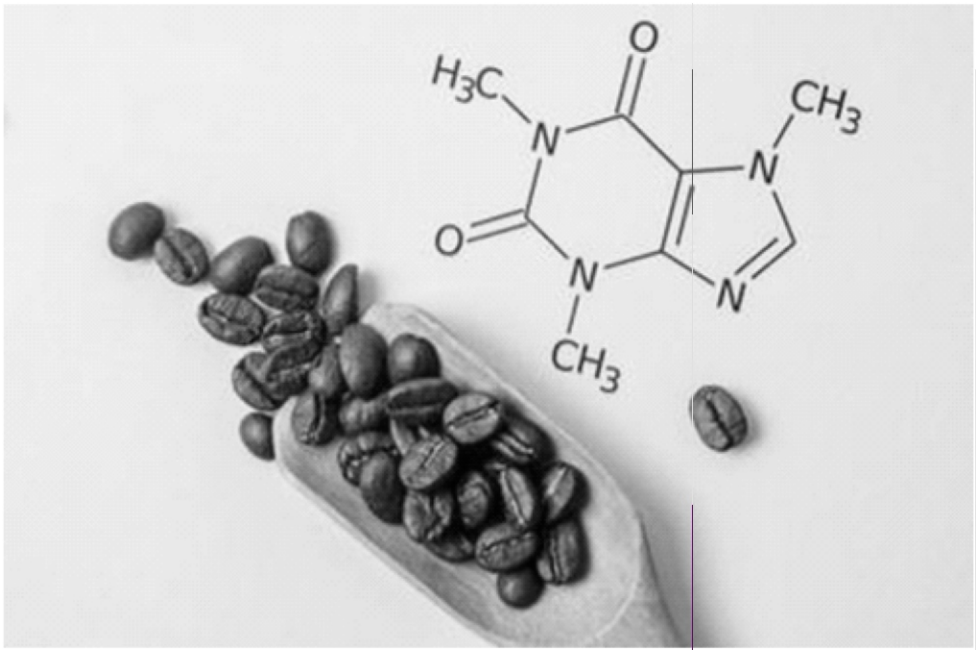
Medical uses of Salicylic acid (Skin's doctor)

- Topical salicylic acid is used to help clear and prevent pimples and skin blemishes in people who have acne.
- It treats other skin conditions by softening and loosening dry, scaly, or thickened skin so that it falls off or can be removed easily.
- Topical salicylic acid is also used to treat skin conditions that involve scaling or overgrowth of skin cells such as psoriasis (a skin disease in which red, scaly patches form on some areas of the body), ichthyoses (inborn conditions that cause skin dryness and scaling), dandruff, corns, calluses, and warts on the hands or feet.
- Salicylic acid is in a class of medications called keratolytic agents.
- Salicylic acid helps cause the wart to gradually peel off. This medication is also used to help remove corns and calluses.
- This product should not be used on the face or on moles, birthmarks, warts with hair growing from them, or genital/anal warts.

KEERTHIKA. V
II B.Sc. CHEMISTRY

CHEMISTRY BEHIND COFFEE

Coffee consists of ripe seeds of coffee arabica Linn, and it belongs to family Rubiaceae. 75% of the world's production of coffee is provided by coffeaarabica, about 25% by coffeacanephora and less than 1% by coffealiberica..



The chemical constituents present are Caffeine, fixed oil, tannin, proteins and carbohydrates. It contains 2-3% caffeine, 3-5% tannin, 13% protein and 10-15% fixed oil.

The main chemical ingredients in coffee beans are Caffeine, Thiamine, Xanthine, Spermidine, Guaiacol, Citric acid, Chlorogenic acid, Acetaldehyde, Spermine and Tannin.

Green Coffee

Green coffee contains about 6-7% of sucrose as soluble sugars and low amount of glucose. Sucrose, fructose and glucose are soluble. Green coffee contains trigonelline (N-methylnicotinic acid) up to 0.6% and is 50% decomposed during roasting. The degradants include nicotinic acid, pyridine, 3-methyl pyridine and other compounds.

Minerals

Potassium is major in coffee ash (1.1%). Calcium (0.2%), and magnesium (0.2%) are present. The major anions include phosphate (0.2%) and sulfate (0.1%), along with traces of other elements.

Caffeine

The best known compound is caffeine (1,3,7-trimethylxanthine) because of its physiological effects (stimulation of the central nervous system, increased blood circulation, and respiration). It is mildly bitter in taste. 10% of the caffeine and about 6% of the chlorogenic acid are present in a coffee drink. During roasting, the caffeine level in beans is decreased. Medicinally, caffeine is used as CNS stimulant, usually combined with another therapeutic agent and in analgesic preparations.

Use of coffee

Coffee is often used as antioxidants, but more importantly coffee is a good source of chromium and magnesium that assist in controlling blood sugar by ensuring proper usage of insulin.

REBECCAL. U
II B.Sc. CHEMISTRY

CREATING PLASTICS AND CHEMICALS FROM WASTE

The University of Delaware researchers report low-pressure method to convert industrially processed biomass into plastics.It is not a secret that we need more sustainable materials if we hope to help the planet. Bio-derived materials are one potential option, but they must be economical if anyone is going to use them.

Led by Professor Thomas H. Epps, III, a team of University of Delaware researchers and collaborators from Canmet, energy are keeping just this type of economics in mind as they look for ways to upcycle biomass into new products. Take lignin, for example. Lignin is a component of plants and trees that provides strength and stiffness to help the flora stand up to what mother nature throws its way.

In the pulp and paper industry, however, lignin is a waste left over from making paper products. This type of lignin, known as technical lignin, is considered the dirtiest of the dirty, something that isn't usable except maybe to burn for heat or to add to tires as filler.

The UD researchers say this widely available resource, about 100 million tons of technical lignin waste is generated annually in pulp and paper mills around the world can be much more valuable. The team has demonstrated that it is possible to efficiently turn industrially processed lignin into high-performance plastics, such as bio-based 3D-

printing resins, and valuable chemicals. An economic and life-cycle analysis reveals that the approach can be competitive with similar petroleum-based products, too.

A paper describing the new method was published on Wednesday, January 19, 2022, in Science Advances. The work was supported primarily by funding from the National Science Foundation Growing Convergence Research (NSF GCR) program, which aims to solve problems through multi-pronged, interdisciplinary collaboration.

"The ability to take something like technical lignin and not only break it down and turn it into a useful product, but to do it at a cost and an environmental impact that is lower than petroleum materials is something that no one has really been able to show before," said Epps, who leads the NSF GCR efforts at UD and is the Allan and Myra Ferguson Distinguished Professor of Chemical and Biomolecular Engineering. He also holds a joint appointment in the Department of Materials Science and Engineering.

Everyday ingredient overcomes high-pressure hurdle

One of the main problems with upgrading lignin is that most of the processes to do it operate at very high pressures and are expensive and hard to scale. Major drawbacks of current industrial techniques include the safety concerns, capital costs, and energy consumption associated with traditional solvents, temperatures or pressures used in the process. To overcome these challenges, the research team replaced methanol, a traditional solvent used in lignin deconstruction, with glycerin so the process could be done at normal (ambient) atmospheric pressure.

Glycerin is an inexpensive ingredient used in liquid cosmetics, soaps, shampoos, and lotions for its moisturizing capabilities. But here, the glycerin helps break down the lignin into chemical building blocks that can be used to make a broad range of bio-based products, from 3D-printing resins to different types of plastics, flavour and fragrance compounds, antioxidants, and more.

SENCHUDAR. K
III B.Sc. CHEMISTRY

FUN WITH CHEMISTRY

- We all know Charlie Chaplin and Mr. Bean are comedians but chemist only know the real comedian is nitrous oxide as it is known as the laughing gas.
- Teachers: Tell the formula for water.
  Student: HIJKLMNO
  Teacher: What?
  Student: H_2O

- Don't drink water while studying. because water reduces concentration
- If you want to be a fire, be aware that your surrounding is sodium bicarbonate free.
- If you want to be a noble gas learn to be a titanium too.
- Mango you are the king of fruit to get you quickly $CaCO_3$ is the shortcut route.
- At lab

  Me: (for sulphur test) I got it.

  Others: Ohh Shit, who got the rotten egg?
- While having lunch others see:

  sambar, rice, side dish, salt

  What chemist see:

  Carbohydrate, protein, retinol, NaCl, H_2O
- Others at night : Are you afraid of ghost?

  Chemist: Do you have any idea about aura?

NITHIYASRI. T.L
III B.Sc. CHEMISTRY

INTERESTING FACTS IN CHEMISTRY

1. Every hydrogen atom in your body is likely13.5 billion years old because they were created at the birth of the universe.

2. Astatine (At) is the rarest element in the world.

3. Per gram Bucky ball sells for $167 million per gram.

4. Famed chemist Seaborg was the only person who could write his address in chemical element.

   ✓ Sg (Seaborgium) named after his name Seaborg.

   ✓ Lr ((Lawrencium) named after his Lawrence Berkeley National Laboratory.

   ✓ Bk (Berkelium) named after the city Berkeley.

   ✓ Cf (Californium) named after state in USA California.

   ✓ Am (Amercium) named after the country America.

5. Gallium element can melt in your palm, its melting point is 29.76˚C.

6. Hydrofluoric acid is least acidic but more dangerous.

7. Air becomes liquid when the temperature is -190 ˚C.

8. Hydrogen has its own antimatter which contains position and antiproton. which is highly expensive, next to the Bucky ball.

GAYATHRI. T
I B.Sc. CHEMISTRY

WHO AM I?

1. I catch fire easily
   But I protect cars in the cold
   You can use me as a fuel
   And yet I am every distiller's goal
   What am I?

2. What is black when you purchase it, red while you are using it, and grey when you discard it?

3. You call me a metal but I flow like a liquid
   Even though I can kill you, you will keep me around
   I am not as dense as gold yet my shine is like silver
   I will always be up when you are feeling down
   What am I?

4. If you get me as a medal
   It means that you have done your best
   I am what you find in abundance
   In a hidden treasure chest
   What am I?

5. I'm in your kitchen pantry, waiting for you to wrap me over something. What am I?

6. Yellow in color, I can be a laboratory risk. You'll most often find me used in an explosive.
   What am I?

7. I am present in marshes
And also in the rumen of cattle
To stop global warming
I do very little.
What am I?

8. Which element in the periodic table is named after a Norse god?

9. Sometimes I am sparkling
But other times I am still
I am a liquid
And I am something you can spill
What am I?

10. You can use me to flatten clothes
Or in industry to make steel
I am in a movie before a man
And on the rim of cart wheels
What am I?

FOR ANSWERS CHECK PAGE No. 40

ATHEEBA FIRDOUSE. T
III B.Sc. CHEMISTRY

DO YOU KNOW THE VALUE OF TIME

- To realise the value of one year ask a student who has failed in his public exam.
- To realise the value of one month ask her mother who has given birth to a premature baby.
- To realise the value of one week ask an editor of weekly magazine
- To realise the value of one minute ask a person who has missed the train.
- To realise the value of one second ask the person who has survived an accident.
- To realise the value of 1 millisecond ask the person who has won a silver medal in Olympics.

FATHIMA RAMSHA. S
III B.Sc. CHEMISTRY

EXAMS vs SPORTS

We all have fun watching IPL matches during summer so why not compare exams with favourite matches

Exam hall - Cricket stadium
Invigilator - Umpire
Question paper - Ball
Answer sheet - Bat
Students - Players
Teachers - Coach
Easy questions - Full toss
Tough questions - Yorker
Exam marks - Wide
Pass marks - Half Century
Centum - Century
Wrong answer but full marks - Free Hit
Re correction Third Umpire
Annual exam - Test match
Term exam - One day match
Class - T 20 match
Result - Score card
Winner - It's you

FATHIMA RAMSHA. S
III B.Sc. CHEMISTRY

WHY IS SOCIAL MEDIA SO ADDICTING?

Whether you use social media to connect with friends and loved ones, watch videos, or simply "kill time," the popularity of this pastime has increased significantly over the last decade. This is especially the case in children and teenagers, as well as young to middle-aged adults. So, how does a seemingly harmless hobby turn into an "addiction"? Like other types of behavioural addictions, using social media can influence your brain in harmful ways. You may use social media compulsively and excessively. You can become so accustomed to scrolling through posts, images, and videos that it interferes with other areas of your life.

Not everyone who uses social media will develop an addiction. Since this activity is becoming more accessible to more people, though, more people may develop an addiction to social media at some point in their lives. While social media can seem like mindless and relaxing fun, it actually has a significant effect on your brain. Whenever you log on to your favourite apps, dopamine signals in your brain increase. These neurotransmitters are associated with pleasure. When you experience more dopamine after using social media, your brain identifies this activity as a rewarding one that you ought to repeat. Such a reaction may be felt more whenever you make a post of your own and gain positive feedback. The positive feelings experienced during social media use are only temporary. The way your brain engages in this positive reinforcement is also seen in other addictions. Thus, as the feel-good dopamine wears off, you'll go back to the source (in this case, social media) for more.

In some cases, social media can be a welcome distraction if you're isolated due to work or an illness. The more you engage, the more your brain will tell you that this is an activity that can help reduce loneliness. A mental health professional can help you determine whether you truly have social media addiction or just really enjoy using it a lot. But there are a few key differences between social media addiction and a habit that you enjoy. These include:

- ❖ Negative effects to your job or college work due to the overuse of social media (e.g., scrolling through your apps at work or instead of studying)
- ❖ Increased use during other activities, such as hanging out with friends and family, or while eating
- ❖ Increased reliance on social media as a way to cope with problems
- ❖ Restlessness and irritability whenever you're not using social media
- ❖ Anger whenever social media usage is reduced
- ❖ Thinking about social media whenever you aren't using it, so much so that it's the first thing you turn to whenever you have the opportunity.

FATHIMA RAMSHA. S
III B.Sc. CHEMISTRY

CHEMISTRY JOKES

Q: Why was the baseball player banned from Chemistry class?
A: He kept stealing the base.

Q: How can you tell when a chemistry joke doesn't work?
A: There's no reaction.

Q: What happened to the woman who got cooled to absolute zero?
A: She's OK now

Q: Who's the most famous spy chemist?
A: Hydrogen Bond.

Q: What do you do with element seeds?
A: Barium

Q: When do elements act silly?
A: Periodically.

Q: What is Iron Man and Silver Surfer called when they team up?
A: Alloys.

Q: What was the chemistry teacher's favorite type of tree?
A: A chemistree

Q: What is the atomic symbol for confusion?
A: Um.

Q: Why are chemists so good at solving problems?
A: They have all the solutions.

Q: What did the hair stylist say when oxygen, hydrogen, sulfur, sodium, and phosphorous walked into her salon?
A: OH SNaP!

Q: Why did Carbon marry Hydrogen?
A: They bonded well from the minute they met.

FEMILA. J
III B.Sc. CHEMISTRY

AN INGENIOUS TOOL FOR BUILDING MOLECULES

Building molecules is a difficult art. Benjamin List and David MacMillan were awarded the Nobel Prize in Chemistry in 2021 for their development of a precise new tool for molecular construction: organocatalysis. This has had a great impact on pharmaceutical research, and has made chemistry greener. Many research areas and industries are dependent on chemists' ability to construct molecules that can form elastic and durable materials, store energy in batteries or inhibit the progression of diseases. This work requires catalysts, which are substances that control and accelerate chemical reactions, without becoming part of the final product. For example, catalysts in cars transform toxic substances in exhaust fumes to harmless molecules. Our bodies also contain thousands of catalysts in the form of enzymes, which chisel out the molecules necessary for life.

Catalysts are thus fundamental tools for chemists, but researchers long believed that there were, in principle, just two types of catalysts available: metals and enzymes. Benjamin List and David MacMillan were awarded the Nobel Prize in Chemistry 2021 because in 2000 they, independent of each other, developed a third type of catalysis. It is called asymmetric organocatalysis and builds upon small organic molecules."This concept for catalysis is as simple as it is ingenious and the fact is that many people have wondered why we didn't think of it earlier," says Johan Åqvist, who is chair of the Nobel Committee for Chemistry.

Organic catalysts have a stable framework of carbon atoms, to which more active chemical groups can attach. These often contain common elements such as oxygen, nitrogen, sulphur or phosphorus. This means that these catalysts are both environmentally friendly and cheap to produce. The rapid expansion in the use of organic catalysts is primarily due to their ability to drive asymmetric catalysis. When molecules are being built, situations often occur where two different molecules can form, which just like our hands are each other's mirror image. Chemists will often only want one of these, particularly when producing pharmaceuticals.

Organocatalysis has developed at an astounding speed since 2000. Benjamin List and David MacMillan remain leaders in the field, and have shown that organic catalysts can be used to drive multitudes of chemical reactions. Using these reactions, researchers can now more efficiently construct anything from new pharmaceuticals to molecules that can capture light in solar cells. In this way, organocatalysts are bringing the greatest benefit to humankind.

KANMANI. K
III B.Sc. CHEMISTRY

WHY DOES ONION MAKE US CRY?

Onions consist of sulphur rich amino acids sulphoxides. When we cut an onion million of onion cells rupture releasing amino acid sulphoxide and some special enzyme. These special enzymes react with amino acid sulphoxide to form a chemical called Syn-propane ethyl s-oxide. It is volatile. i.e., it evaporates easily at normal temperature to form a gas. These gases enters our eye and react with substance that keeps our eye lubricated and hence a milder sulphuric acid is produced which causes a burning sensation inside our eye. In order to wash off this acid lacrimal glands produces some disinfecting liquid. As eyes cannot hold an extra amount of disinfecting liquid, tears fall down making us cry.

BABY SHALINI. S
III B.Sc. CHEMISTRY

COMPOSITION OF CHEMICAL ELEMENTS IN HUMAN BEING

Chemical elements are the building block of life. They make up the staggering variety of molecules that are combined to form DNA, cellular organelles, cells, tissues, and organs. This article presents those elements that are present in the human body, the proportion of them, and the various essential functions they play.

Elements that make up the human body

The body is, for all intents and purposes, an extraordinarily complex machine. This requires a multitude of parts all working together in complicated relationships from the micro- to macromolecular level. The structure of the building blocks that make up the sum of these parts, such as proteins and nucleic acids, is determined by the proportion and interaction of chemical elements. Some elements are much more common than others. The human body is approximately 99% comprised of just six elements: oxygen, hydrogen,

nitrogen, carbon, calcium, and phosphorus. Another five elements make up about 0.85% of the remaining mass: sulfur, potassium, sodium, chlorine, and magnesium. All of these 11 elements are essential elements.The remaining 0.15% of the human body is comprised of trace elements. The combined mass of the trace elements does not add up to the mass of magnesium, which is the least common of the non-trace elements. Some of the trace elements (about a dozen or so) may be essential for life, based on laboratory evidence.

The function of chemical elements in the body

Most chemical elements found in the human body play a vital role. Some trace elements, such as titanium and caesium, may be contaminants. Some, such as lead, mercury, arsenic, and cadmium are active toxins depending on the amount present.The function of the essential elements in the human body, by order of percentage of mass, are as follows:

Oxygen

Oxygen is the most common element in the human body, comprising approximately 65.0% of body mass. Most of the oxygen present is found in the form of water. Oxygen plays a critical role in metabolism and respiration and is found in every major organic molecule in the body including proteins, carbohydrates, fats, and nucleic acids.

Carbon

Carbon is the next most common element in the human body, making up 18% of the body by mass. Its role is mostly structural, forming the “backbone” of many organic molecules.

Hydrogen

Hydrogen is the most abundant element in the universe (about 75% of total mass) and makes up around 10% of the human body by mass. It is present in the form of water (along with oxygen) as well as being an important element in organic molecules.

Nitrogen

Nitrogen comprises 3% of the human body by mass. It is found in all organisms in molecules such as amino acids (which make up proteins), nucleic acids (DNA and RNA), and adenosine triphosphate (ATP), an essential energy transfer molecule.

Calcium

Calcium is the most abundant metal in the human body, at around 1.4% by mass. Arguably it's most well-known function is in the formation of bones and teeth and lack of calcium in the diet can lead to a variety of degenerative conditions. Other important roles in the human body include protein synthesis, maintaining the potential difference across cell membranes, and acting as second messengers in signal transduction pathways.

Phosphorus

Phosphorus is highly reactive, and because of this property, it is never found as a free element on earth. Phosphates are essential to life, and this bound form of phosphorus is a major component of essential organic molecules such as phospholipids, ATP, and nucleic acids. It comprises 1.1% of the total body mass of the human body.

Potassium

Potassium makes up less than 1% of body mass. It plays a vital role in nerve transmission via the transfer of potassium ions across nerve cell membranes.

Sulphur

The tenth most common element in the universe and the fifth most common on earth, sulphur plays an essential role in the human body. It is found in the body almost always in the form of metal sulfides and organosulphur compounds. Sulphur is also a major structural element of the protein keratin, which is found in skin and hair.

Sodium

Sodium, an alkali metal, is commonly found in salt. Sodium ions contribute to osmotic pressure as they are the major cation in the extracellular fluid (ECF). Sodium also plays a key role in nerve transmission.

Chlorine

Chlorine plays an essential role in maintaining the acid-base balance of blood, along with the formation of tendons, teeth, and bones. It is commonly found in salts and in combination with potassium and sodium in the body. It also contributes to liver function and helps to eliminate organic waste.

Magnesium

Magnesium is the least common of the essential elements in the human body. Some 300 or so enzymes require magnesium ions to function properly, and magnesium ions interact with compounds such as DNA, RNA, and ATP.

Trace Elements

Trace elements play many roles, some more important than others, whilst others contribute no discernible function whatsoever. Some are actively toxic to humans.The three most abundant essential trace elements are iron, fluorine, and zinc. Iron plays an essential role in human health as part of haemoglobin, which transports oxygen around the body in the blood. Fluorine is important for teeth. Zinc is required by over 300 enzymes and 1000 transcription factors and is vital for eye health and reproductive organ growth.

The main source of all of these elements is diet. Some of the elements are more essential than others and they are found in a staggering array of compounds and molecules in the human body. Some can even cause active harm to the body and the levels at which they are present in the body can determine just how harmful the effects are. The proportions of chemical elements vary from person to person depending on a wide variety of factors, but as a rule, they are mostly uniform across the species.

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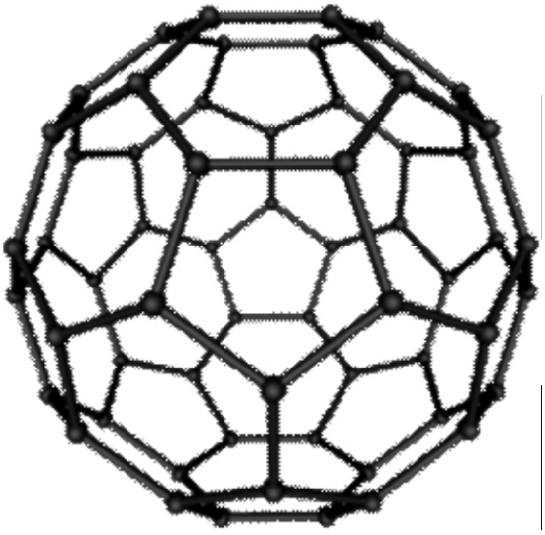
SWEETHA. S. D.
II B.Sc. CHEMISTRY

FULLERENE AND ITS APPLICATION

Fullerene consists of 60 sp^2 carbon atoms arranged serially in hexagons and pentagons order to form a spherical structure. They are the smallest stable known nanomaterial.



Fullerene synthesis is done by arc discharge method and analysis is done by high performance liquid chromatography (HPLC). Synthesis process shows that C60 and C70 are produced at 1000˚C and that the concentration increases as pulse duration increases. Their unique molecular structure results in extraordinary macroscopic properties including high tensile strength, high electrical conductivity, high ductility, high heat conductivity, and relative chemical inactivity.

Fullerenes in coatings

Buckminster fullerenes act as dry lubricants in coating application.Fullerenes offer lubricant coatings.Nanosphere powders are being developed to reduce friction and improve wear resistance in parts where there are rolling and sliding contacts, such as ball bearing, chains,gears, pumps,screws and artificial joints.

Fullerenes as antioxidants

Fullerenes act as radical sponges scavenging, around 20 free radicals per molecule of fullerene.This action is due to the electron deficient alkene nature of fullerene which takes up the electrons and scavenge the radicals.The efficiency of these entities goes up to around 100 times the leading antioxidants.Oxidation causes cell death & damage and also deterioration of plastics,food spoilage and metal corrosion. There are rejuvenated creams based on vitamin C60 which had replaced vitamin E.

Fullerenes for Asthma and Arthritis

This commonly known disease is also triggered by various types of allergens, and is also dependent on Mast cells. Fullerenes can be studied more to prevent Mast Cells from activating and causing an allergic reaction inside the lungs, i.e. coughs.

Mast cells are also a key attribute in arthritis. Thus, fullerenes are being investigated further, to discover new ways to both hinder Mast Cell related diseases, and figuring out how they could prevent arthritis.

SULAKSHANA VASUKI. K
I M.Sc. CHEMISTRY

NANOROBOTICS AN EMERGING TECHNOLOGY IN BIOMEDICINE

Imagine a world where cell-sized robots operate in our bodies. This might sound like a story in science fiction. However, it is probable that micro/nanorobotics will soon play a prominent role in medicine. Biomedical robots are highly specialized and miniature devices that are capable of conducting specific activities within the human body. As a result of the recent developments in nanotechnology and materials science, the innovation of both micro and nanorobots for a wide range of biomedical applications has advanced. The term medical micro/nanorobots describe all nano to micron-size structures (300 nm−300 μm) capable of converting power sources into kinetic energy. Both micro and nanorobots will rely on chemically powered motors to meet their energy needs. To accomplish this, these motors obtain energy by converting locally available fuels such as oxygen or glucose to drive themselves towards various cellular structures. Nanorobots can also depend on externally powered motors based on either magnetic or ultrasound technology to propel their motion.

Key components of a nanorobot

Nanorobots are designed to have a diameter of 0.5-3 microns and parts of dimension 1-10 nanometers. The four major parts in a nanorobot are camera, payload, capacitor and swimming tail. The most important components in the construction of nanorobots are carbon, sulphur, hydrogen, oxygen and fluoride which are utilized to make nanoscale gears and other nano components. The fabrication of nanorobots will involve sensors, actuators, control, power, communications and interfacing across spatial scales and between organic/inorganic as well as biotic/abiotic systems. Nanotubes, nanowires and biosensors are employed in the construction of sensors in the nanomachine. Flagella motors, DNA and RNA actuators, protein-based motors, liquid crystal elastomers are used in the design of actuators in the device. Navigation components in nanorobots are usually fabricated using β sheets and sperm like motors. In the design of joints and links in a nanorobot, synthetic joints, molecular bonds, DNA hinges and nanotubes are utilized.

Biomedical applications of micro/nanorobots

The enormous promise and benefits that these micro/nanorobots bring to the field of biomedicine along with the existing challenges, gaps and limitations are highlighted.

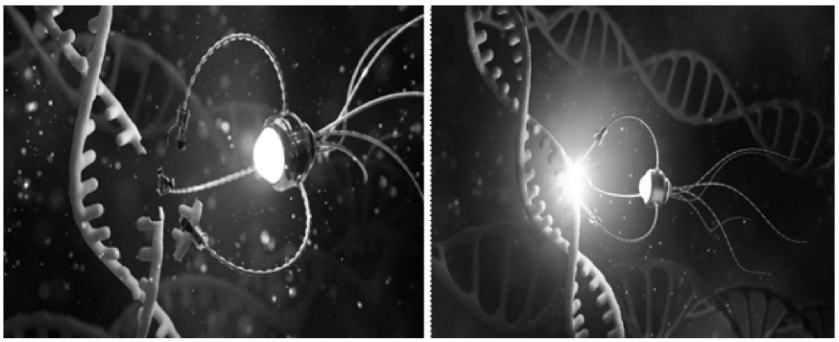
Micro/nanorobots for targeted delivery

Drug delivery vehicles should have some specific features, such as propelling force, controlled navigation, cargo towing and release, and tissue penetration, in order to ensure precise delivery of therapeutic payloads to specific disease areas. Despite the fact that

these requirements remain unmet challenges for current drug delivery systems, micro/nanorobots constitute a novel and appealing class of delivery vehicles that can meet these desirable attributes. The drug carriers have walls that are just 5- 10 atoms thick and the innermost drug-filled cell is usually 50- 100 nanometers wide. When they detect signs of the disease, thin nanowires present in their walls generate an electrical pulse forcing the walls to breakdown and the drug is delivered. A significant advantage of using nanorobots for drug delivery is that the dosage and time of drug release may be easily regulated by adjusting the electrical pulse. Additionally, the walls disintegrate quickly and are thus harmless to the body.

Micro/nanorobots for disease diagnosis and prevention

When the molecules indicate signs of disease, the chip is programmed to emit an electrical impulse signal. Special sensor nanorobots can be introduced into the blood stream beneath the skin, where they check the contents of the blood and warn of any possible diseases. They can also be used to make note of blood sugar levels. Nanorobots are also designed to remove the fat deposits in the blood vessels thereby preventing cardiac arrest. Medical researchers are interested in not only detecting the disease but also in treating and repairing the damaged tissues without causing pain, especially in the treatment of cancer as shown in the following figure. In human body, nanorobot is repairing and fixing the DNA molecules in the cells.



Micro/nanorobots for precision surgery

Robot-assisted surgery is a rapidly evolving field that allows doctors to conduct a wide range of minimally invasive treatments with extreme precision, flexibility and control. Unlike their large robotic counterparts, tiny robots have the ability to traverse throughout the human body, operate in many hard-to-reach tissue areas and hence address specific health issues. One way in which micro and nanorobots have been adapted for surgical applications is through the incorporation of mobile microgrippers. These tetherless microgrippers improve the capabilities of both micro and nanorobots to capture and retrieve tissue samples from difficult-to-reach places within the body.

Micro/nanorobots in dentistry

Subgingival surfaces can be covered with nanorobotic dentifices injected into the mouth via mouthwash or toothpaste.Properly configured nanoroboticdentrificehas the potential to identify and destroy pathogenic bacteria existing in the plaque and elsewhere that will help in decreasing bad breath.These mechanical gadgets which move at a rate of 1-10 microns per second would be affordable and be programmed to disable themselves if swallowed.

Micro/nanorobots for sensing

Micro/nanorobots have shown promising potential for carrying out various demanding biosensing applications towards specific disease diagnoses due to their unique characteristics of autonomous motion, easy surface functionalization and effective capture and isolation of target analytes in complex biological media.These receptor-functionalized micro/nanomotors have tremendous binding and transport capabilities, paving the way for new ways to identify and isolate biological targets in unprocessed body fluids, such as proteins, nucleic acids, and cancer cells.The constant movement of these functionalized synthetic motors improves target binding efficiency and increases the sensitivity and speed of biological assays significantly.

Micro/nanorobots for detoxification

Self-propelled micro/nanorobots have also been employed as effective cleaning tools in the detoxification process. Detoxification techniques rely on self-propelled micro/nanorobots that quickly collect and eliminate the poison rendering the environment harmless. To create unique nanoscale bio detoxification devices, nanomotors have been coupled with cell-derived natural materials capable of mimicking the natural features of their source cells. Several types of cell-mimicking micromotors for detoxification have been created based on the biological features of red blood cells.

Conclusion

The optimization of nanolocomotion has been one of the key issues that biomedical researchers have confronted with the development of robotic systems.Furthermore, the potential dangers and hazards are not fully understood.Even though much more research must still be done to confirm the *in vivo* and clinical efficiency of these devices, their impressive abilities are quite promising. To completely comprehend the medical potential of micro/nanorobots, nanorobotic scientists should collaborate more closely with medical researchers to conduct thorough investigations of the robots' behaviour and functionality, including studies on biocompatibility, retention, toxicity, biodistribution, and therapeutic

efficacy. We can envision that with close collaboration between the nanorobotic and medical communities, these challenges can be gradually addressed, eventually expanding the horizon of micro/nanorobots in medicine.

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JULIA SEBASTIAN
Ph.D. RESEARCH SCHOLAR IN CHEMISTRY

LAUGHTER AND HEALTH

Laughter is the best medicine. It brings people together in ways that trigger healthy physical and emotional changes in the body. Laughter strengthens the immune system, diminishes pain and protects from stress. Humor lightens burdens and connects us to others. Recent studies reveal that laughter may help in releasing anger and aids forgiveness. Laughter enlightens self-healing. The habits of laughing are a tremendous resource such that it helps in strengthening both physical and mental health, problem solving and find a solution. The best thing is this priceless medicine is free and easy to give. During childhood, we use to laugh, have fun for hundreds of time a day, but adulthood is not as much like the earlier, life tends to be hectic. This can be changed by having good relationship, embracing the good moments and this adds years to our lives.

Laughter stimulates the brain to produce happy hormones - endorphins, serotonin, dopamine, oxytocin.These hormones promote over all wellbeing and sometimes may even relieve pain, increases blood flow, improved functioning of blood vessels, thus protects from cardiovascular problem. Being in a happy state lightens away the load of anger. Viewing from a positive perspective may help to move on from problems without holding bitterness.

Benefits of laughter:

1. Boosts immunity, lowers stress hormones, adds joy to life, relieves tension, attracts others, promotes group bonding.

2. Humor helps to keep a positive, optimistic outlook through difficult situations.

Some ways to start:

Smile. Smiling is the beginning of laughter and it is contagious. Keep the habit of smiling whenever you see something or someone, even if it is mildly pleasing. Smile at people you pass in the street, the person serving you a morning coffee. Notice the effects on others. Count your blessings. Feeling gratitude for the simple things in life increases positivity and this will keep you away from negative thoughts. As laughter becomes as part of your life it keeps you in a well minded state, makes you more active and helps in maintaining a good relationship with family, friends and coworkers. Laughter takes you to a higher place from where you can view the world with the joyful and positive perspective.

PRIYANKA JAYASHINY. D
III B.Sc. CHEMISTRY

CHEMISTRY IN SMARTPHONES

In Battery:

- Most phones use lithium ion batteries
- Lot of energy can be stored in the atomic bonds
- Lithium batteries lose only 5% of their charge each month
- The battery has a metal casing
- The casing contains three long spirals of thin sheet
- A positive electrode made of lithium cobalt oxide ($LiCoO_2$)
- A negative electrode made of carbon
- Separator is a micro perforated plastic and separates the positive and negative electrodes and still allows ions to pass

Electronics:

- Nickel is found in the microphones and other electrical connections
- Tantalum is used as a main component for micro capacitors
- Silicon is made into the chip in the phone
- Copper, Silver, and Gold are used for wiring whilst copper, gold, and silver are made into micro electrical components

Smart phone Chemistry:

- 70 out of the 83 elements on the periodic table can be found in your smartphones
- Smartphones may contain up to 62 different types of metals
- Rare earth metals such as scandium, yttrium, and elements 57-71. Elements 57-71 are known as lanthanides
- One single iPhone could contain 8 different rare-earth metals
- You could find 16 of the 17 rare-earth metals if you examine several varieties of smartphones
- You won't find promethium because it is radioactive
- Dysprosium and neodymium cause your smartphones to vibrate
- Dysprosium and neodymium are contained in magnets in your smartphones

MADHUMITHA. R
III B.Sc. CHEMISTRY

IMPORTANCE OF FOLIC ACID DURING PREGNANCY

Folic acid is the man-made form of folate or vitamin B_9. Folate is found in spinach,nuts,seeds and fruits. Our cells need folate to make DNA,other genetic material and in the creation of new RBC. In the first month of pregnancy, the brain and spinal cord begin as neural tube,the neural tube starts off as a groove and folds to form a closed tube. In small number of pregnancies neural tube defects occur as the neural tube does not close properly. This defect can lead to babies being still born,or having lifelong disabilities. It is because of the deficiency in folate, the risk of neural tube defects(NTDs) increases. Folate reduces the risk of NTDs by about 70%

SWATHI. D
II B.Sc. CHEMISTRY

CHEMISTRY BEHIND FIREWORKS

Fireworks are one of the most spectacular outdoor shows.They produce amazing bursts of colours that take a variety of shapes. The source of most fireworks is a small tube called an aerial shell that contains explosive chemical. An aerial shell is made of gun powder, which is an explosive. When we watch fireworks, we actually see the explosion of the stars. Each star contains four chemical ingredients: an oxidizing agent, fuel, metal containing colorant and binder. In the presence of flame (or) a spark, the oxidizing agent and the fuel are involved in chemical reactions that create intense heat and gas. The metal containing colorant produces the colour, the binder holds together the oxidizing agent, fuel and colorant.

The explosion of a fire work happens in two steps. The aerial shell is shot into the air and then it explodes in air, above the ground to propel the shell that is placed inside a tube, called a mortar, which is often buried in sand. A lifting charge of gun powder is present below the shell with a fuse. When ignited with a flame the gun powder explodes, creating lot of gas and heat that cause pressure beneath the shell. Then, when the pressure is great enough, the shell shoots up into the sky. After a few seconds, another fuse inside the aerial shell, called a time - delay fuse ignites, causing the bursting charge to explode. The shell is to burst open, propelling the stars in every direction. The timing of 2 fuses is important. Aerial shell is to explode when it is high in the sky. If the timing of the fuses is not right, the shell can explode too close to ground injuring people nearby.

Fireworks are so special because they produce beautiful colours. These colours are formed in one of the two ways: Luminescent and incandescent. Incandescent light is produced when a substance is heated so much then it begins to glow. Heat causes the substance to become hot and glow. When the temperature of a firework is controlled, the glow of its metallic substance can be manipulated to be a desired colour at a proper time. The light is produced by electrons inside the metal atoms. These electrons absorb energy from the heat, which causes them to move from their original ground energy state to an excited state. Then immediately these electrons go to a lower energy state and emit light with a particular energy and characteristic colours. The colours are specific to metals present in fireworks.

The metal containing colorants for some common fireworks are listed:

- Red - Strontium salts
- Orange - Calcium salts
- Yellow - Sodium salts
- Green - Barium salts
- Blue - Copper salts
- Purple - Copper & Strontium
- Silver - White Hot Magnesium & Aluminium
- White - Burning Metal (Magnesium, Aluminum, Titanium)

These are colourant compounds used in fireworks and the colours they produce.

LINDA NINETTE. V
II B.Sc. CHEMISTRY

MEMBRANE FILTRATION

Water is one of the renewable resources essential for sustaining all forms of life, food production, economic development and for general well-being. Industrial processes usually generate a large amount of residual water, which must be submitted to appropriate treatment before its disposal into the environment. This residual water usually has complex contaminants such as organic pollutants which seriously threaten human health and ecological safety. Therefore, the development of efficient treatment technologies for complex wastewater systems has extensive attention. Membrane filtration process is a physical separation method characterized by the ability to separate molecules of different sizes and characteristics. The degree of selectivity of a membrane depends on the membrane pore size. Depending on the pore size, they can be classified as micro filtration (MF), ultrafiltration(UF), nano filtration (NF) and reverse osmosis (RO) membranes. It can also be of various thickness, with homogeneous or heterogeneous structure. Its driving force is the difference in pressure between the two sides of a membrane.

Dead end filtration is the one where the flow of water is perpendicular to the membrane surface. The structure of the pectin molecule is the key to the properties of pectin and its use in different applications. It is proposed to use as a natural plasticizer to produce films with improved film properties, especially regarding the water vapour barrier and antioxidant properties. It possesses the ability to withstand both acidic and alkaline conditions. Poly(vinylalcohol) is a water- soluble synthetic polymer. It is used in sizing agents and it is helpful in binding the water soluble polymer and the target component, which is desired to be separated from the aqueous solution. Silveroxide

nanoparticle is one of the leading nanotechnology materials and products for its unique antibacterial and plasmonic properties. Clay fillers have received considerable attention in recent years, both in research and industry, as they allow for the manipulation of the base polymer material to improve on the mechanical property by adding small micro or nano sized clay fillers. Membrane filtration experiment is to be carried out using "Dead- End-Filtration". Initial concentration of pH, dosage of the catalyst, contact time are to be varied to study extensively the removable efficiency of dye, pesticide and heavy metal using functionalized pectin/PVA composite membrane.

SWETHA. M
I M.Sc. CHEMISTRY

SCIENTISTS FIND A 'GREENER' WAY TO MAKE JEANS BLUE

"Our research was dedicated to find sustainable technologies for better processing of textiles," says Smriti Rai. She is a textile researcher at the University of Georgia in Athens. Her team showed that nanocellulose can cut water and chemical consumption during dyeing. They shared the details in the October 21 issue of Green Chemistry. Jeans' blue colour comes from a pigment known as indigo. Indigo does not dissolve in water. Textile makers treat indigo with harsh chemicals to make it soluble. Then, they dip denim in a vat of this solution. It takes multiple dips to turn the cloth blue.

All of this pigment-treated water is also full of hazardous chemicals. Many of these pollutants may not be removed by water-treatment plants. Later, when that treated water is released into the environment, it can pollute waterways. But the team's innovative new dyeing technique totally eliminated this chemistry, says Rai.

Making dye stick to fibers better

To give denim its blue hue, the researchers add indigo powder to a hydrogel containing a small amount of nanocellulose. Hydrogels are a type of polymer that absorbs water. The researchers make theirs just runny enough to smear onto denim. Then they screen-print the coloured go onto the fabric. This step does away with need for a vat of dye. It also eliminates all but maybe 3 or 4 percent of the water needed for dyeing. Those nanocellulose rods form a mesh that traps the dye molecules. The mesh also has a large surface area. At the nanoscale, its tiny bumps and ridges collectively add up to more surface area than the bare denim had to start with. So more dye will stick to fabric coated with nanocellulose and more dye means a deeper blue.

LAVANYA. R
II B.Sc CHEMISTRY

THE LINK BETWEEN COLOUR AND TASTE IS LOGICAL

Since oranges are orange, we expect orange-coloured drinks to be orange-flavoured. Red drinks should taste like cherries, and purple drinks should taste like grapes. If food is multicoloured, it could be mouldy and should not be eaten, unless you are eating blue cheese which gets its distinct flavour from mould!

An astonishing amount of the foods we eat is processed.

These foods are altered from their natural states to make them safe, say, to remove harmful bacteria, make them appealing, and prolong their shelf life. About 70% of the diet is from processed foods. Much of what we eat would not look appealing if it was not coloured. Think of food colouring, also called food dye, like cosmetics for your food.

Natural food colouring

To avoid so much processed food, some people have advocated using natural food colouring, whenever possible. Natural food dyes have been used for centuries to colour food. Some of the most common ones are carotenoids, chlorophyll, anthocyanin, and turmeric.

Carotenoids have a deep red, yellow, or orange colour. Probably the most common carotenoid is beta-carotene, which is responsible for the bright orange colour of sweet potatoes and pumpkins. Since betacarotene is soluble in fat, it is a great choice for colouring dairy products, which typically have a high-fat content. So, beta-carotene is often added to margarine and cheese. And, yes, if you eat too many foods that contain beta-carotene, your skin may turn orange. Fortunately, this condition is harmless.

Chlorophyll

Chlorophyll is another natural pigment,found in all green plants. This molecule absorbs sunlight and uses its energy to synthesize carbohydrates from carbondioxide and water. This process is known as photosynthesis and is the basis of life on Earth. Mint -or lime-flavoured foods, such as candy and ice cream, are sometimes coloured using chlorophyll.

Anthocyanin

The best natural source for deep purple and blue colours is anthocyanin. Grapes, blueberries, and cranberries owe their rich colour to this organic compound. Unlike beta-carotene, anthocyanins which form a class of compounds rather than a single chemical compound are soluble in water, so they can be used to colour water-based products. Blue corn chips, brightly coloured soft drinks and jelly are often dyed with anthocyanins.

Turmeric

Another natural food additive you have probably consumed is turmeric, which is added to mustard to impart a deep yellow colour. Turmeric is obtained from the underground stem of a plant that grows in India, and it is commonly used asa spice in Indian food. Turmeric is also a great acid/base indicator. If you add a basic substance to mustard, it will turn red.

Why go artificial?
Why bother with artificial, or synthetic, food colourings?
Aren't there enough natural colours to go around?

A big reason to go artificial is cost. Synthetic dyes can be mass-produced at a fraction of the cost of gathering and processing the materials used to make natural food colourings.

The administration approved just seven synthetic food colourings for widespread use in food. Artificial food colourings were originally manufactured from coal tar, which comes from coal. Early critics of artificial food colourings were quick to point this out. Today, most synthetic food dyes are derived from petroleum or crude oil. Some critics may argue that eating oil is no better than eating coal. But the final products are rigorously tested to make sure they contain no traces of the original petroleum. One dye that does not have a petroleum base is Indigoline (Indigo Colour) or indigotin, which is a synthetic version of the plant-based indigo dye is used to colour blue jeans.

The next time you enjoy strawberry flavoured yoghurt or cranberry juice, you may be eating bugs! But don't worry. These insects did not contaminate your food by accident. An extract from a type of insect,known as the cochineal, was deliberately added by the food manufacturer. For centuries, the Aztecs used these insects to dye fabrics a deep-red colour. If you crushup 70,000 of these bugs, you can extract a pound of a deep-red dye called carminicacid ($C_{22}H_{20}O_{13}$).

This dye is safe to ingest, so it found its way into a variety of food and cosmetic products that required a red colour.

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KAVIYA SHREE. R. S. J
II B.Sc. CHEMISTRY

CHEMISTRY OF LIFE

Answers for who Am I?

1.	Ethanol
2.	Charcoal
3.	Mercury
4.	Gold
5.	Aluminium
6.	Nitric acid
7.	Methane gas
8.	Thorium
9.	Water
10.	Iron

BIOMOLECULES

Lecture delivered through the zoom portal on October 21, 2021

Dr. V. Sabareesh
Assistant Professor Senior Grade I
Centre for Bio-Separation Technology (CBST),
Vellore Institute of Technology (VIT), Vellore - 632 014, Tamil Nadu.

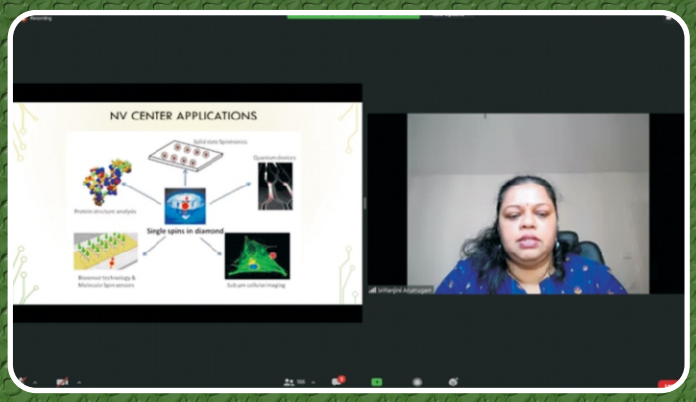
Abstract

Our planet, earth can be thought to be made up of two major systems: living system and non-living system. In the language of ecology, these two systems comprises of 'biotic' and 'abiotic' components, respectively. Animals, plants and micro-organisms (microbes) are biotic components, whereas air, soil and water are abiotic components. Both biotic and abiotic components are made up of 'atoms' and 'molecules'. Depending on the nature of biotic and abiotic component, the atomic and molecular composition would vary. Atoms can be mostly found in the form of 'ions', e.g., Na^{+}, K^{+}, Ca^{2+}, Cl^{-}, CO_3^{2-}, etc. and these ions have very important roles in several biological processes, e.g., nerve signal transmission and maintenance of cellular osmotic balance.

This talk is focused on the 'molecules' present in biotic components of the ecosystem, viz., biological sources. Such molecules are therefore called as 'biomolecules'. Every biomolecule in a living organism has some important role or the other for proper functioning, maintenance, survival and also for protection. Therefore, alterations to the native/natural form of a biomolecule can disturb the normal health/condition, thereby leading to abnormal or diseased state. Hence, it is essential to study and understand the structures of biomolecules.

The word 'compound' is very widely used in the fields of chemistry, biology and physics, all over the world, which refers to the ingredient or the constituent in a particular material or substance. The word 'compound' may be considered synonymous to 'molecule' and hence, the molecular constituents occurring in biological systems may be called as 'biocompounds'. However, the word 'biocompound' is not used in the scientific literature. Therefore, biomolecules can also mean ingredients or constituents in a particular biological system or in a biomaterial.

In this talk, I will be describing about the molecular structures of different types of biomolecules such as carotene, lycopene, limonene, porphyrin, chlorophyll, heme, lipids, nucleic acids, peptides, proteins and carbohydrates. All these molecules are very commonly found in plants, animals and micro-organisms.



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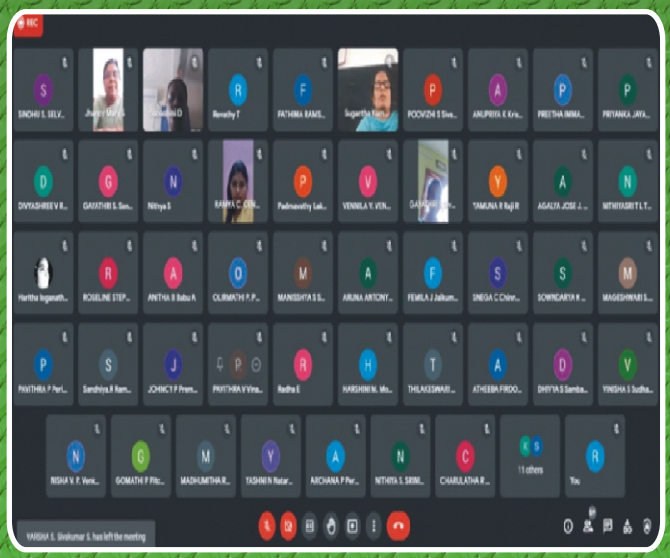

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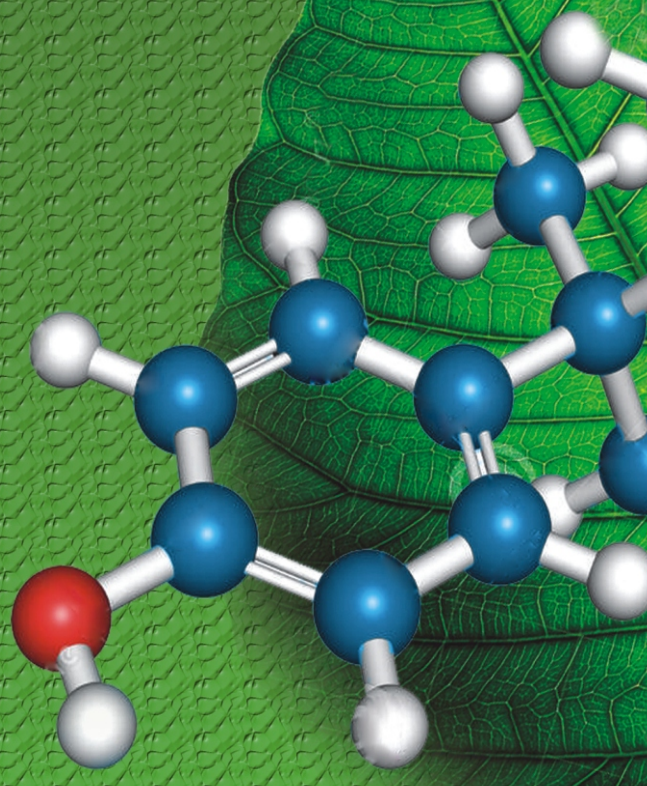

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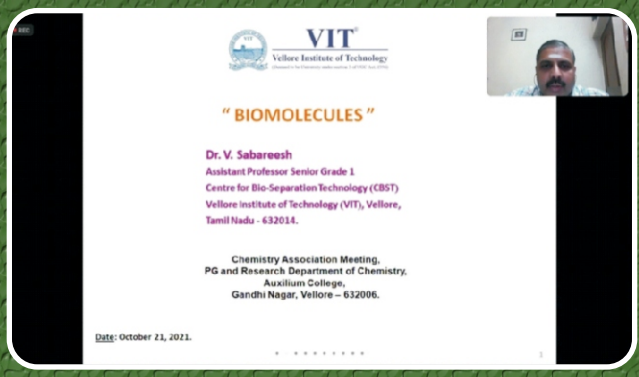
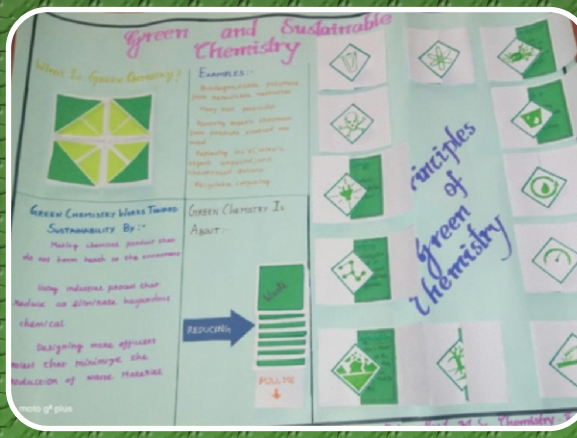


Inauguration of the Chemistry Association - Lectur

Dr. A. Sabareesh, Asst. Professor,

Senior Grade- I, CBST, VIT, Vellore.



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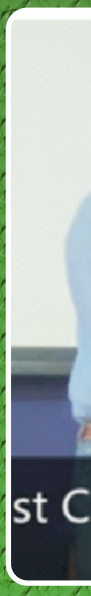

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