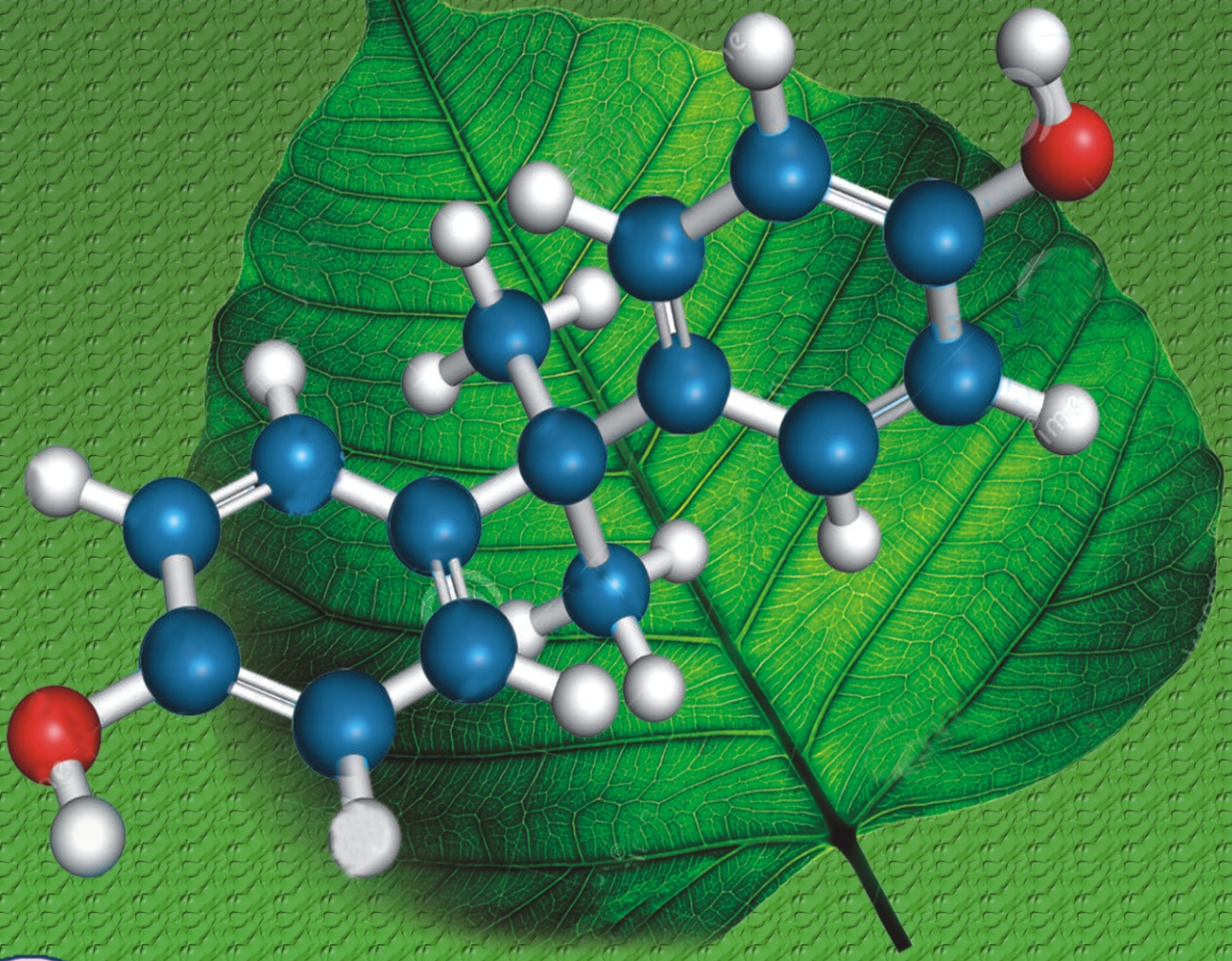
CHRYSL

Vol XVII - 2021



Post Graduate & Research Department of Chemistry
Auxilium College (Autonomous)
(Accredited by NAAC with A+ Grade with a CGPA of 3.55 out of 4 in the 3rd cycle)
Vellore-632006

Vol XVII - 2021

Post Graduate & Research Department of Chemistry
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(Re-Accredited by NAAC with "A^{+}" Grade)
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From the HOD's Desk

The academic year 2020-21 started with a lot of uncertainties making educators and students get acquainted with a new turn of technology, missing the happy and pretty faces of the students and their lively presence in the campus. Yet, the educators and the educants seamlessly adopted to the online classes and online mode of examinations and evaluation. Yes, Necessity is the mother of all inventions. It was outstanding to see the students rise up to the occasion and tackle all the COVID issues without compromising their academics and extra & co-curricular activities. As a department we really feel that this enthusiasm is going to be the new benchmark for the upcoming batches.

The Department of Chemistry is happy to bring out the 17th edition of the annual periodical CHRYSL- Chemistry Resonating in Young Students' Lives amidst the challenges faced due to the extended lockdowns. Our students are always active and cooperative. No virus can break their enthusiasm. The staff incharge of this edition, Dr. B. Scholastica Mary Vithiya and Dr.V.S. Gowri were so quick to collate and edit the articles. Thanks to my dynamic CHRYSL team for their incessant support during the erudite journey of collating the CHRYSL articles.

This issue is a testament of the resolute efforts of our dear students. Keep Reading. Keep Listening. Keep Improving. Let's wait for what's in store for the next academic year.

Dr. S. Jhancy Mary
Asso. Prof. of Chemistry
Head of the Department
Auxilium College
Vellore-632006.

Editorial

Welcome to the XVII edition of CHRYSL, the annual magazine of the Department of Chemistry, Auxilium College, Vellore. It is noteworthy to share this moment of pride and joy in bringing out this edition meticulously with the cooperation of all the students and staff amidst this pandemic situation. We are happy to claim that we are ready with all new hopes and ideas which is going to surely unfold the unravelled world of the ever-growing fields in chemistry.

The magazine needs to be viewed as a platform for the students and faculty which enables their creative flower to blossom naturally. As the saying goes, ***"Mind like parachute works better when opened",*** this humble initiative is to set the budding minds to set free in the realm of creativity and experience to create a world of beauty in word and art.

The enthusiastic work and art of our young students is sufficient to hold the interest and admiration of our readers. We believe that our success depends on our power to perceive, the power to observe and the power to explore. We are sure that the positive attitude, hard work, sustained efforts and innovative ideas exhibited by our young buddies will surely stir the minds of the readers and encapsulate them with joy and pleasure.

It gives us immense pleasure to state that this magazine has successfully accomplished its objective. We take this opportunity to thank all the contributors as their contribution is the reason that makes the magazine endearing with our readers. As Helen Keller says, ***"The world is not only moved only by the mighty shoes of its heroes, but also by the aggregate of the tiny pushes of each honest worker",*** this magazine would not have been possible without the sincere support of the Head of the Department, Faculty members and students. We are thankful to our respected Principal for her encouragement. May God bless all our efforts.

Dr. B. Scholastica Mary Vithiya,
Asst.Prof. of Chemistry
and
Dr. V.S. Gowri,
Asst. Prof. of Chemistry

OH MY LOVELY CHEMICAL FRIEND!

S.D. Sweetha
I B.Sc. Chemistry

Oh my lovely chemical friends!
That by patterns you are arranged
You help me understand
How this world has changed

We can talk about the elements
And your periodic trends
They are also my friends
And I love them to the end

Hydrogen in the air
Fluorine in the teeth
We can find you everywhere
And even underneath

Oh my lovely chemical friends!
Bonding of our love makes a trend
That is not the end
No men can mend

CHEMISTRY AGAINST COVID-19

Sr. Athisa Roselyn Maheo FMA
Ph.D. Research Scholar (Full time)

Coronavirus disease of 2019 (Covid-19) which had its origin in Wuhan city of China has thrown life out of gear. Life has never been the same since the onslaught of this dreaded global pandemic. It has dramatically altered everyday life across the globe. Social life has upended all of a sudden. There is no sector of society that has not borne the brunt of this pandemic: education, business, entertainment industries, sports to name a few. The poor and the have-nots are the most affected. With the new UK virus mutant strain, it poses an even greater threat to the whole world. One of the biggest challenges to the scientific community is the regular mutation the virus undergoes in its genome.

At this juncture, a question arises, "How has Chemistry contributed to the fight against this global menace?" Chemistry plays an indispensable role in this worldwide combat against the virus. Its role ranges from studying the structure of the virus, developing improved testing technologies and working at suitable vaccines to giving safe treatments. It also helps in the development of materials and techniques used by basic researchers, virologists and clinicians. Researchers and chemists have from the very outset set to task to design and produce protective equipment for front-line health workers. Disinfectants, diagnostic tests, ventilators, protective masks, gloves and gowns, Intensive Care Unit medicines and equipment and protective clothing are some contributions of Chemistry. More rapid and accurate testing kits are being produced, more effective drugs to bring down the viral loads are being manufactured and above all the most important venture of all scientists and researchers is developing a safe vaccine with good efficacy that will once for all terminate this dreaded SARS - CoV-2 - the virus that causes Covid-19. Some of the drugs that are being investigated to treat Covid-19 patients are Hydroxychloroquine, Chloroquine, Remdesivir, Lopinavir and Ritonavir, Nafamostat and Camostat, Famotidine, Umifenovir, Nitazoxanide and Dexamethasone. However, the safe and effective uses of these are under various stages of clinical trials in different countries.

The role of chemistry is evident even in the simple precautionary measures such as washing of hands with soap and use of hand sanitizers. Soap destroys the lipid layer of the virus, leaving the content open to the environment which then gets destroyed easily. The hand sanitizer which contains alcohol usually ethanol or isopropyl alcohol denatures the proteins by disrupting the hydrogen bonds and so renders them ineffective. The use of disinfectants and bleaches is to destroy the viruses that survive on the surfaces of objects. The mechanism with which the bleaches destroy the virus is that they act as strong oxidising agent, attacking the proteins which have amide links, thereby destroying the hydrogen bond too. The spikes present in the virus, though prove dangerous are also the basis on which vaccines are being developed.

For the moment, one keeps one's fingers crossed, hoping that things will soon change for the better and that will wipe away the virus from the earth.

ROLE OF CHEMISTRY IN MITIGATING CLIMATE CHANGE

Sr. Athisa Roselyn Maheo FMA
Ph. D. Research Scholar (Full time)

Climate change is a sad reality we witness in our own yard. The pace at which climatic change is taking place is quite alarming. Drastic changes are happening in our own lifetime. While Science and Technology has contributed immeasurably to improving the lifestyle of the people ranging from significant launching of mankind and satellites to the space and sophisticated healthcare facilities to insignificant recreational activities, these improvements have also resulted in dire environmental changes. There is no denying the fact that chemistry, while contributing a lion's share to progress and development is also to a large extent responsible for climate change. However, the situation is not all grim for there are many other ways in which chemistry can play a pivotal role in mitigating the global climatic change.

Chemistry and chemists are central to sustaining the Earth and all its inhabitants in the face of the many challenges of a finite world by contributing in a variety of ways in tackling climate change. Our research and our technology can provide clean water and nutritious food, meet energy demands and reduce pollution, and help lead the way to sustainable development everywhere. Chemists and chemical engineers probe into, observe, understand, protect and improve the environment. They develop tools and techniques capable of measuring the level of pollution and work at improving our understanding of atmospheric and ocean chemistry, study the consequences of climate change, develop new energy and carbon mitigation solutions, and furnish scientific ways in helping crops to tolerate the changing conditions.

To this end, many positive steps are being continually updated and implemented. Cleaner fuels such as hydrogen fuels are developed, batteries for electric vehicles are in use, engines are designed and built-in ways which would increase its efficiency while emitting minimum pollutants and pollution control devices are fitted onto vehicle exhaust. Use of catalysts can help greatly in mitigating release of pollutants. Platinum or palladium catalysts oxidise carbon monoxide and hydrocarbons to produce carbon dioxide and water, while rhodium catalysts reduce oxides of nitrogen to produce nitrogen and oxygen. Thus catalysts, adsorbers, and particulate filters that reduce pollutant emissions are fabricated.

Studies show that the emission of non-methane volatile organic compounds have been decreasing continuously since 1990, to less than half, through the implementation of the chemical processes and formulations involving these substances. New generations of automobiles consume considerably lesser fuel than those from just two decades ago. New chemical materials with improved performance are being developed providing lower energy consumption. Bio fuels are currently being developed based on non-edible fats or waste. Chemistry also has a role in other green alternative energy sources like wind, tidal or solar energy. There is a concerted effort to synthesise

new materials which are able to efficiently transform the solar energy into electricity or to resist under extreme corrosion and mechanical conditions. These approaches will decrease the greenhouse gases released into the atmosphere. Avoiding deforestation and desertification, improving the health of the forests, in particular, rain forests are simple and effective means to fight the menace of global warming.

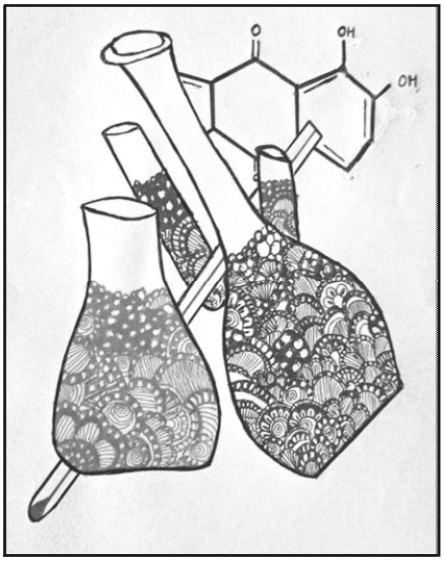
Carbon dioxide is the largest contributor to the climate change. The increase in its concentration leads not only to global warming but also increases the acidity of the oceans. Thus to diminish the level of CO_2 in the atmosphere, this particular gas can be considered as a potential raw material for the construction of compounds and materials of application in our everyday life.

Green Chemistry refers to the design and use of chemical products that will reduce chemical related impact on human health and ultimately eliminate contamination of the environment. Prevention, atom economy, design for energy efficiency, use of safe solvents, use of catalytic reagents, use of renewable livestock, etc. are some of the principles of Green Chemistry. With Green Chemistry gaining significant ground, one is hopeful that all life on earth, be it flora or fauna suffer lesser harm from toxic substances and that there is lower threat to global warming, ozone depletion and smog formation.

TITRATION OF LIFE

P. Lalithapriya
III B.Sc. Chemistry

Life is like a titration
Make your dream as an analyte and fill it in the burette
Titrate it against the person's words which hurt you lot in aconical flask
Add a few drops of self - motivation as an indicator
Shake your lethargicness into nimbleness to get a
COLOURFULL and FRUITFULL ENDPOINT ……



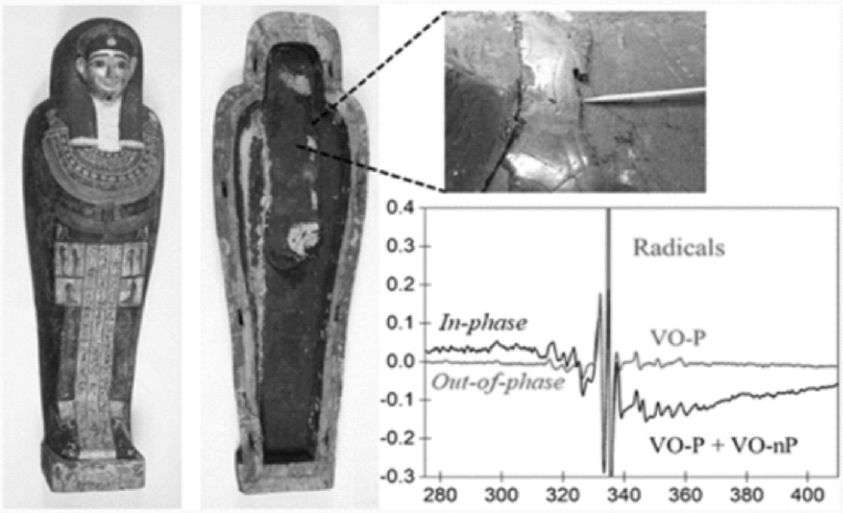
A. Merlin Monisha
I M.Sc. Chemistry

In the titration of Life...
Both Happiness and Sadness are present
You just need the right indicator to observe it.
Before the End point approaches.

A NON-DESTRUCTIVE METHOD FOR ANALYZING ANCIENT EGYPTIAN EMBALMING MATERIALS

K. Yogalakshmi
II M.Sc. Chemistry

The embalming material used by ancient Egyptians was a complex mixture of natural compounds such as sugar gum, beeswax, fats and variable amounts of bitumen. Bitumen is a black, highly viscous form of petroleum that arises primarily from fossilized algae and plants. There are various techniques to analyze ancient Egyptian embalming materials, but they require the preparation and separation steps that destroy the sample. So a non-destructive technique called electron paramagnetic resonance (EPR) is used to detect the two components of bitumen formed during the decomposition of photosynthetic life, Vanadyl porphyrins and carbonaceous radicals, which provide information on the presence, origin and processing of bitumen in the embalming material.



EPR of the black matter from the Egyptian coffin

The black matter obtained from an ancient Egyptian coffin, human mummies (from 744-30 B.C.), were analyzed by EPR and compared to reference bitumen samples. It showed the relative amounts of vanadyl compounds and carbonaceous radicals and one could differentiate between bitumen of marine origin and land-plant origin. Vanadyl compounds that are formed from reactions between the vanadyl porphyrins and other embalming components were also detected. The linear correlation between in-phase and out-of-phase EPR intensities of radicals and vanadyl porphyrins in balms and in natural bitumen reveals a nanostructuration of radicals and vanadyl porphyrin complexes, which are not affected by the preparation of the balm. This shows the remarkable chemical stability of paramagnetic probes in historical bitumen in ancient Egypt.

ACIDS PRESENT IN FRUITS AND VEGETABLES

G. Priya
III B.Sc. Chemistry

VEGETABLES		
NAME OF THE VEGETABLES	**ACID PRESENT**	**MOLECULAR FORMULA**
Carrot and Broccoli	Malic Acid	$C_4H_6O_5$
Beetroot, Raddish and Cabbage	Oxalic Acid	$C_2H_2O_4$
Beans	Phytic Acid	$C_6H_{18}O_{24}P_6$
Lady's Finger	Folic Acid	$C_{19}H_{19}N_7O_6$
Drumstick	Palmitic Acid	$C_{16}H_{32}O_2$
FRUITS		
NAME OF THE FRUIT	**ACID PRESENT**	**MOLECULAR FORMULA**
Apple	Malic Acid	$C_4H_6O_5$
Banana	Oxalic Acid	$C_2H_2O_4$
Grape	Tartaric Acid	$C_6H_6O_6$
Orange and Pineapple	Citric Acid	$C_6H_8O_7$
Guava	Ascorbic Acid	$C_6H_8O_6$
FLOWERS		
NAME OF THE FLOWER	**ACID PRESENT**	**MOLECULAR FORMULA**
Hibiscus	Hydroxy citric Acid	$C_6H_8O_8$
Jasmine	Cinnamic Acid	$C_9H_8O_2$
Lotus and Sunflower	Linoleic Acid	$C_{18}H_{32}O_2$
Lily	Phytic Acid	$C_6H_{18}O_{24}P_6$
Tulip	Lauric Acid	$C_{12}H_{24}O_2$

THE AROMA OF RAIN

B. Rakshana

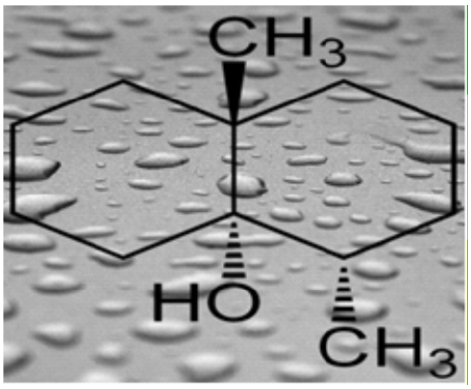
III B.Sc. Chemistry

We love, love, love rain. Everything about it, the smell before, during and after, the way everything feels so clean after a rainfall. When those first fat drops of summer rain fall to the hot, dry ground, have you ever noticed a distinctive odour? It invariably hits you the sweet, fresh, powerfully evocative smell of fresh rain. It's really a surprise as the reason behind it is an aroma chemical.

Back in 1964, a pair of Australian scientists (Isabel Joy Bear and R. G. Thomas) began the scientific study of rain's aroma in earnest with an article in Nature titled "Nature of Agrillaceous Odor". In it, they coined the term petrichor to help explain the phenomenon, combining a pair of Greek roots, petra (stone) and ichor (the blood of gods in ancient myth). Of course rain itself has no scent. But moments before a rain event, an "earthy" smell known as petrichor does permeate the air. Petrichor is a combination of fragrant chemical compounds.

Geosmin - The main contributor to petrichor are actinobacteria (actinomycetes). These tiny microorganisms can be found in rural and urban areas as well as in marine environment. In moist, a common substance geosmin, is produced by these soil-dwelling bacteria. The bacteria secrete the compound when they produce spores, then the force of rain landing on the ground sends these spores up into the air, and the moist air conveys the chemical into our noses.

Geosmin ($C_{12}H_{22}O$) is a type of alcohol. Alcohol molecules tend to have a strong scent, but the complex chemical structure of geosmin makes it especially noticeable to people even at extremely low levels. Our noses can detect just a few parts of geosmin per trillion of air molecules. During a prolonged period of dryness when it has not rained for several days, the decomposition activity rate of the actinobacteria slows down. Just before a rain event, the air becomes more humid and the ground begins to moisten. This process helps to speed up the activity of the actinobacteria and more geosmin is formed. The scent eventually goes away after the storm has passed and the ground begins to dry. This leaves the actinobacteria lying in wait, ready to help us know when it might rain again.



Ozone and lightning - Ozone also plays a role in the smell, especially after thunderstorms. When lightning strikes, the diatomic molecules of oxygen and nitrogen split, and rearrange to create nitric oxide (NO) and ozone (O_3).Ozone molecules are carried down by the droplets of rain to contribute to the scent.

Volatile plant oils - During dry weather, plants produce compounds that accumulate in between rocksand in soil. When it rains, these compounds are released into the air to add to the earthy smell of petrichor. Stearic acid and palmitic acid are common plant oils. All these make rain smell so good.

INTERESTING FACTS

C. S. Nandhini
II M.Sc. Chemistry

- Around 1% of the sun's mass is oxygen.
- Air becomes liquid at about -190°C.
- Thioacetone is the most smelliest compound.
- Mosquitoes like the scent of oesterogen, hence, women get bitten by mosquitoes.
- Goldfish eyes perceive the visible spectrum, infrared and ultraviolet light.
- Water expands as it freezes. Hot water freezes quicker than cold water.
- Penguinone($C_{10}H_{14}O$) is an organic compound and its name comes from the fact that it resembles a penguin.
- Hot water is more likely to break thick glass than thin glass.
- If you expose a glass of water to space, it would boil rather than freeze.
- The world's most expensive material is antimatter. (1 gram = 62 trillion).

CHEMISTRY GLOBE

Kalaivani
I M. Sc. Chemistry

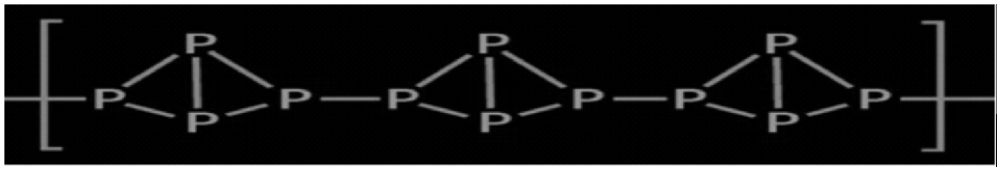
EXCITING FACTS ON DAY TO DAY CHEMICALS

S. Manisshya
II B.Sc. Chemistry

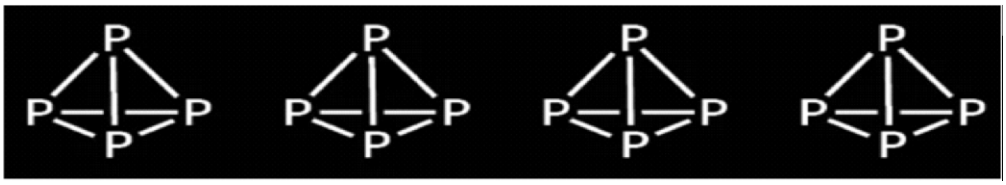
Match heads

Match-heads are made of a combination of chemicals. The main ingredients are potassium chlorate, sulfur and glass. There is no phosphorus in the match head. Red phosphorus is basically what makes up the striking surface, along with more powdered glass or sand. The main goal of the sand/glass present in both the match-head and the striking surface is to cause heat through friction.

Potassium Chlorate : Main ingredient (45-55%) in the heads of safety matches. Phosphorus Sesquisulfide : Component in the heads of 'strikeany where' matches. Antimony (III) Sulfide : Added to some matches to make them burn more vigorously. The striking surface of safety match boxes contains red phosphorus and an abrasive substance. When struck, a small amount of white phosphorus is produced, which ignites.



Red phosphorus



White Phosphorus

Coke + mentos

Adding 'Mentos' to a bottle of coke causes a large amount of pressure to build up. This basically makes the coke go flying as a soda geyser. The responsible process is called 'nucleation'.

Coke or soda is filled with carbon dioxide (fizz). This contained CO_2 is dissolved into the liquid and it tries to come out. In the absence of Mentos, this process goes on slowly. That's why if you put the coke into a glass, it doesn't release a lot of CO_2 at once.

The surface of Mentos is build up from a lot of microscopic layers of sugar, making it extremely irregular, full of crannies and nooks, which make up the perfect 'nucleation weapon'. In contact with soda , this extremely irregular surface will make a lot of bubbles to rapidly form, building up a huge pressure that results in the well known geyser.

Colour of oxygen

As a gas, elemental oxygen (O_2) is colourless, odourless and tasteless. However, if you cool it down it's enough to liquefy or freeze it, it becomes pale blue. This is due to oxygen becoming paramagnetic when it condenses into liquid or solid phase. The unpaired electrons originate a 'magnetic asymmetry' in the molecules. This creates an absorption band in the visible spectrum, which absorbs red light resulting in blue colour.

Neon gas and lighting

Neon gas was discovered in 1898 by Sir William Ramsay and Morris Was. Travers. They knew there must be an element bn the periodic table between Helium and Argon, so they conducted research about liquid air. They cooled air until it became a liquid, then warmed the liquid and collected the gases that boiled off. They then discovered not one, but three new gases: Krypton, Neon and Argon

Georges Claude, a French engineer, invented neon lighting in 1902. He owned an air liquefaction company, which is where the fun began. He took left over neon to create the first neon light tubes. He did this by passing an electric current through neon gas in sealed tubes, thus causing it to have a bright reddish orange light.

Neon has many uses in our everyday lives. Neon is used in advertising signs, vacuum tubes, wave meter tubes, lighting arrestors, high voltage indicators, television tubes, plasma tubes and helium-neon lasers. In addition, liquid neon, is used as cryogenic refrigerant.

Cryonics

Cryonics is the low temperature freezing (usually at -196°C or -320. 8°F or 77.1K) and storage of a human corpse or severed head, with speculative hope that resurrection may be possible in the future.

Freezing needs to begin as soon as possible after the patient dies to prevent damage to the brain. First the body is cooled in an ice bath to gradually reduce its temperature. In some cases, CPR will also be administered to prevent brain cells from dying.

Doctors will then drain the body and replace the blood with an antifreeze fluid designed to stop harmful ice crystal forming. The body is then packed in ice and transferredto a facility.

On arrival it is put into an Arctic sleeping bag and cooled by nitrogengas to -110°C over several hours. After weeks, the body is slowly frozen until it is at a temperature of -196°C. It is then suspended in liquid nitrogen and transferred into a “patient care bay “, where it will remain indefinitely until science advances.

Cryogenics facilities also offer the option of neurocryo preservation where the head is removed and frozen without the body.

CHEMISTRY BEHIND A CUP OF COFFEE

M. Irene Keren
II B.Sc. Chemistry

Americano and latte: Cappuccino if you please: Macchiato and espresso tell me what are all of these?

For most of us, our life will not start if we don't take a sip of this drink. Humanity runs on coffee…

A CUP OF COFFEE

Coffee gets its name from a plant named coffee. To make a drink, the coffee bean undergoes a series of processes which involves roasting, grinding and brewing. It has strong antioxidant properties that can help protect the skin from sun damage.

WHAT IS IN YOUR CUP OF COFFEE?

1. Caffeine

It is a natural refresher that millions of people rely on each day.

2. Chlorogenic acid

$C_{16}H_{18}O_9$ is responsible for the undesirable bitterness found in brewed coffee. It may also help in weight loss by modulating blood glucose levels.

3. Phenols

C_6H_6OH is formed from the decomposition of chlorogenic acid and number of other compounds. They are responsible for much of the harsh tartness which is predominantly found in dark roasted coffee.

Acidity in coffee

Most coffee varieties are acidic. Several factors contribute to coffee's acidity. The main processes are roasting duration, brewing method & the fineness of the grind. The brewing process involved in the preparative method releases ninemajor acids that give a unique flavour to a cup of coffee. The acids namely are cholorogenic, quinic, citric, acetic, lactic, malic, phosphoric, linoleic and palmitic. The process which releases acids gives the beverage a pH of **4.85 to 5.10** and is therefore considered to be acidic.

Why is coffee bitter?

The chlorogenic acid (CGA) found in coffee accounts upto 8% of the composition of unroasted coffee beans, as they react to form quinolacetones, phenylindanes, and melanoids. These compounds contribute to flavour and bitterness. The longer the coffee grounds are in contact with the water, the more bitter compounds enter the drink and the stronger it tastes.

Chemistry of caffeine

Caffeine ($C_8H_{10}N_4O_2$) is known as the world's most predominant drug and is the most widely consumed psychoactive drug, it is legal and unregulated in nearly all parts of the world. It is the key reason to boost our brain Function. According to Anne Marie Helmenstine "Caffeine" is the common name for trimethylxanthine. This chemical is also recognized as caffeine, theine and methyltheobromine. It is categorized as a central nervous system drug (CNS) and is a derivative of xanthine ($C_5H_4N_4O_2$) chemical group. Caffeine is mildly soluble in water at room temperature (2g/100 mL). It works by blocking the action of brain chemicals called adenosines, which work to naturally trigger tiredness. The amount of caffeine in our bloodstream peaks 15 to 45 minutes after intake. Caffeine and other methylxanthines are used in many medications to treat a range of ailments. In North America, 90% of adults consume caffeine daily. Many natural sources of caffeine also contain various mixtures of other xanthine alkaloids, including the cardiac stimulants theophylline and theobromine and other substances such as polyphenols which can form insoluble complexes with caffeine. Although caffeine is consumed worldwide it is slotted in both beneficial and harmful brace for human health. Health experts state it as beneficial in low dosage and toxic in high dosage.

Positive caffeine effects

- Increases alertness and restlessness
- Increases focus and concentration
- Boosts our physical performance
- Aids in weight loss
- It is known to reduce the risk of cancer, heart diseases, diabetes, Alzheimer's disease, dementia etc.,

Side effects

- Loss of sleep
- Causes addiction
- Reduces fertility rate by 50% in women
- Too much consumption of coffee increases the caffeine level in the body which can lead to heart strokes, diabetes, high cholesterol level, spinal bone loss, acid reflux and various other diseases.

Coffee is an integral part of our lives. The tolerance level for it varies from person to person. However, to reap its health benefits and eliminate its risk, one should not drink more than one or two cups per day.

INTERESTING FACTS

K. Gowthami

II M.Sc. Chemistry

- COPPER AND BORON MAKE FLAMES TURN GREEN

  If you add compounds of copper or boron to alcohol it will burn with a green flame.

- SMELL OF COINS IS NOT THE SMELL OF METAL

  It is produced by volatile compounds which are formed from organic substance (for e.g.: human sweat) on contact with the metal, which simply acts as a catalyst.

- IRON, WHICH WE USUALLY ENCOUNTER AS A COMPONENT OF STEEL

  It is quite hard metal but in fact, pure iron crystals without impurities are even softer than aluminium.

- A LITRE OF SEA WATER CONTAINS 35 GRAMS OF SALT

  More than half of which is sodium chloride. The rest is mainly calcium, magnesium chloride and sulfates, which gives sea water a bitter taste.

- THE METAL GALLIUM CAN MELT IN THE HAND

  Its melting point temperature is 29.8^{o}C.

- Chalk is made of trillions of microscopic skeleton fossils of plankton.
- Miracle material GRAPHENE is a better conductor of electricity and heat.
- DRY ICE is the solid form of carbon dioxide.
- Tabletop “volcanoes” can be created using “AMMONIUM DICHROMATES”.
- Talc is the softest known substance.
- The average shot of Exspresso contains less caffeine than a typical cup of coffee.

Answers:

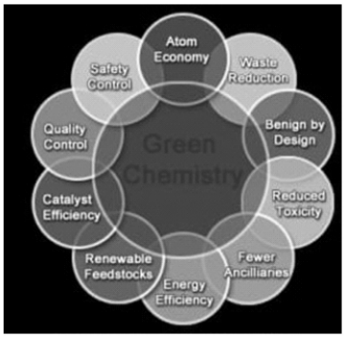
1. Hydrogen	**6. Cesium**	**11. Strontium**	**16. Argon**
2. Lithium	**7. Francium**	**12. Barium**	**17. Krypton**
3. Sodium	**8. Beryllium**	**13. Radium**	**18. Xenon**
4. Potassium	**9. Magnesium**	**14. Helium**	**19. Radon**
5. Rubidium	**10. Calcium**	**15. Neon**	**20. Oganesson**

GREEN CHEMISTRY

S. Vinitha
I M.Sc. Chemistry

Introduction

Green Chemistry reduces and eliminates the use of hazardous substances in the design, manufacture and applications of chemical products and so it is called as "sustainable chemistry". Paul.T.Anastas is called as the "Father of green chemistry". It is based on twelve principles.



Applications of green chemistry

- For dry cleaning perchloroethylene was used, it is replaced by liquid CO_2
- The use of phosgene and methylene chloride in the synthesis of polycarbonates has been replaced by diphenyl carbonate.
- In the preparation of adipic acid, benzene is replaced by corn starch or cellulose.
- Aniline used is replaced by indigo enzymatically.
- Supercritical carbon-dioxide is used in the preparation of chips.
- Polylactic acid is produced from fermentation of corn and is biodegradable.

Major uses

- Saving energy
- Minimum global changes
- Minimize the depletion of resources
- Food supply
- Releasing non-toxic substances into the environment
- Chlorine gas is replaced by hydrogen peroxide in the bleaching of paper

Conclusion

To overcome the toxic world and to replace the world from hazardous chemical world, green chemistry has to develop. Humans are a part of whole of nature on which we depend, and also we are governed.

KNOWLEDGE OF CHEMISTRY

G. Srimathi
III B.Sc. Chemistry

118 Og

The heaviest element in the world is Oganesson. First conceived of in 1979 and given the placeholder name of Ununoctium, this synthetic element was finally developed and recognized in 2016. Upon its synthesis, it was renamed after the important nuclear physicist Yuri Oganessian.

Pencil body

Our body has enough graphite inside of it to produce roughly 9,000 pencils.

Can you smell it?

There's nothing like the fresh, clean smell after a good thunderstorm. This is due to the chemical reaction lightning has on the earth when it strikes. When lightning strikes, it creates ozone, the oxygen compound which protects the earth-by fracturing oxygen molecules, which then reform into ozone, and release a smell into the air that lingers.

Airbag safety

The airbag in cars can save your life, but they are actually made of a highly toxic substance called sodium azide. The airbag is full of these salts and their release once triggered by the vehicle to increase their temperature in order to burst the bag out of its compact place. Don't worry though, as, after this fraction of a second increase in temperature, they transpose into nitrogen gas, which is what actually causes the airbag to expand.

Water babies

Adult humans are typically made up of approximately 60% water, however, at birth, we consist of nearly 80% water. After one year, the water content drops to 65%, and as the child ages, it stabilizes at 60%.

Daddy

The "father" of the periodic table is Dmitri Mandeleev. He created the periodic table of elements essentially as a giant sheet. Working as a professor at St. Petersburg State University, he had to submit a description for all chemical elements but was pressed for time, so he simply slapped together a large data set of atomic weight. This is why the table was ordered by atomic weight.

Mendeleev then used some empty spaces to anticipate not-yet-discovered elements, and even to predict what their weights and chemical behaviors would be. However, this also led him to deny the existence of elements he did not foresee, as he did with the discovery of argon, gallium, scandium and germanium, simply because they didn't fit in his table.

Mendeleev was a controversial figure during his lifetime. His second marriage caused a public controversy because his divorce was not finalized, and in Imperial Russia, one had to be

divorced for seven years before they could remarry, making his marriage illegal. Due to this, the Russian Academy of Science refused him from being accepted, even though he was responsible for the transformation of Russian chemistry.

Saliva

Food is a necessity however, food that tastes good is one of the greatest pleasures of life. You can thank your saliva for this, as without that moisture, you wouldn't be able to taste anything. Saliva works to break down the food, which in turn dissolves the chemicals onto the tongue's taste receptors as it contains the enzyme ptyalin.

Filling the balloon

Helium has the ability to not just make your voice high, but can also get itself high. Being lighter than oxygen and the air around us gives it the ability to float.

FINGERPRINTING POWDER

R. Taslim Unnisa

III B.Sc. Chemistry

The skin on the fingers, palms and soles are known as friction skin. These areas have no hair or oil glands. When friction touches an object they will be leaving a latent print.Fingerprint powder is used to make these print visible.

White fingerprint powder

This is made from haddonite white, which is a dusting compound made from titanium dioxide, kaolin and french chalk or from titanium dioxide, purified talc and kadin lenis.

Lanconide another white powder is made from zinc sulfide, zinc oxide, barium sulfate, titanium dioxide, bismuth oxychloride and calcium carbonate.

Black fingerprint powder

It is used on light-coloured surfaces. Common ingredients in black powder include graphite, charcoal, lampblack, photocopier toners and anthracene.

Powders may also combine a number of compounds. Dactyl black is made from a combination of graphite, lampblack and gum acacia. Lead, mercury, cadmium, copper, silicon, titanium and bismuth is also used for fingerprint powder. Among this lead and mercury are less common as both the materials present a health hazard.

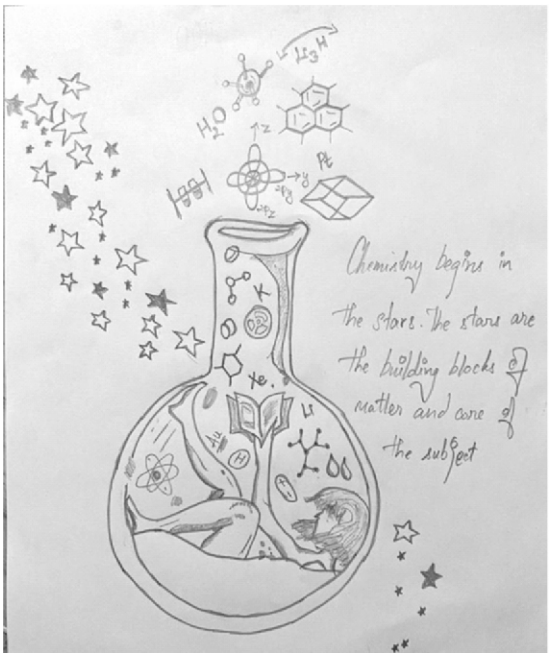
Fingerprinting chemicals

Iodine, cyanoacrylate, silver nitrate and ninhydrin are used as primary chemicals to reveal and to collect fingerprints.These chemicals react to substances within the fingerprint, making the print change colour so that forensic analysts can see it better.

FINDING VALUE IN TEXTILE WASTE WATER

M. Shahada
II M.Sc. Chemistry

The synthetic dyes used in textile industry are used on a massive scale in this heavily polluting industry, and inefficiencies in the dyeing process means that dyes end up not only in our clothing as intended but, in our waterways, posing a major threat to both the aquatic environment and human health. Currently, the most widely used method of removing dye from wastewater are flocculation, precipitation and adsorption. However, both methods produce large quantities of sludge, which ends up being disposed of in landfills or by incineration and causes secondary pollution. Thus, researchers address this issue by not only treating the dye wastewater but also find an innovative use for it. Industrial dye wastewater is rich in nitrogen and sulphur form the azo and sulfite functional groups present in the dyes, and these elements can act as hetero atom dopants in carbon material for energy storage devices. Nitrogen and sulphur present in dye-contaminated wastewater are incorporated into an energy material. The dye containing waste water is subjected to hydrothermal reaction with glucose and then chemically activated with potassium hydroxide. This one pot synthesis can yield porous carbon material. Thus, on testing the electrochemical performance of a cell, based on this electrode material confirmed that it is indeed a promising candidate for energy storage applications. The storage capacity is completely based on the size of the carbon material used.



A. Meera Apsana,
I M.Sc. Chemistry

THE "Mpemba" EFFECT

S. Fathima Ramsha

II B.Sc. Chemistry

Sometimes hot water freezes more quickly than cold water. This is called the Mpemba effect after the student who observed it.

Although Aristotle, Bacon, and Descartes all described hot water freezing faster than cold water, the notion was mostly resisted until the 1960's when a high school student named Mpemba noticed that hot ice cream mix, when placed into the freezer, would freeze before ice cream mix that had been cooled to room temperature. Mpemba repeated his experiment with water rather than ice cream mixture and found the same result, the hot water froze more quickly than the cold water.

When Mpemba asked his physics teacher to explain the observations, the teacher told Mpemba his data must be in error, because the phenomenon was impossible.

Mpemba asked a visiting physics professor, Dr. Osborne, the same question. This professor replied that he did not know, but he would test the experiment. Dr. Osborne had a lab tech perform Mpemba's test. The lab tech reported that he had duplicated Mpemba's result, "But we'll keep on repeating the experiment until we get the right result." (that would be an example of poor science.) Well, the data was the data, so when the experiment was repeated, it continued to yield the same result. In 1969 Osborne and Mpemba published the results of their research. Now the phenomenon in which hot water may freeze faster than cold water is called the Mpemba Effect.

HOW CHEMISTRY MATTERS IN COVID 19?

M. P. Riya

III B.Sc. Chemistry

Cleaning our hands with soap is necessary to destroy corona virus. Soap is a surface active agent like the lipids which make up the protective covering of the virus. It disrupts the lipid layer and leaves the contents open to the environment which destroys the fragile RNA.

Why is alcohol used in sanitizers?

Mixture of water and alcohol (mostly ethanol or isopropyl alcohol) can disrupt the lipid layer, it also denatures the proteins, by breaking the hydrogen bonding which give them their specific shape and so renders them ineffective.

Glycerine is often added to both soaps and sanitizers to counteract the drying of skin. Glycerine is a humectant which builds a shell of water around and the osmotic pressure drives more water onto the skin.

Stated that SARS Cov- 2 is known to survive on surfaces, the use of bleaches to attack the virus is also suggested. Bleach operates by being a strong oxidising agent and attacks the proteins, which have amide links and easily removes Hydrogen atoms and this molecular damage stops the virus from working.

Surface wipes is an antiseptic where benzalkonium chloride is the active ingredient. They leave an antiseptic layer on the surface which kills the virus and germs.

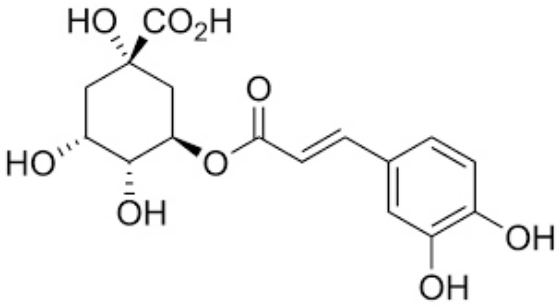
WHY IS COFFEE BITTER? THE CHEMISTRY OF COFFEE

M. Rakshitha

III B.Sc. Chemistry

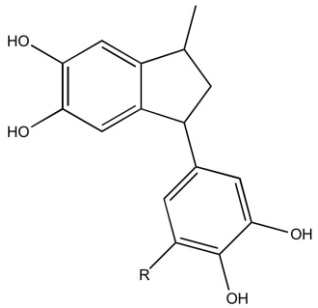
'COFFEE'- the drink that coaxes you to wake each morning. A refreshing cup of coffee is all you need to kick start your day. But what exactly gives coffee its aroma and taste? Thanks to chemistry!

'CAFFEINE' is the most important chemical compound that leaps to mind when you think of coffee. Although it is a bitter compound, it only contributes about 15% of coffee's bitterness. The bitter taste of coffee is a result of two pungent smelling antioxidant compounds found in roasted coffee beans - chlorogenic acid lactones and pheny lindanes. The chlorogenic acid lactones as the name suggests does not contain any chlorine atom in their structure. Rather, it refers to the light green colour produced when these acids are oxidised. When coffee beans are roasted, these chlorogenic acids react to form a variety of different products, which can all affect the taste of the coffee.



CHLOROGENIC ACID

In medium to light coffee brews, the main source of bitterness is from chlorogenic acid lactones whereas in dark roasted coffee, the breakdown products of these chlorogenic acid lactones have an increasing effect on the bitterness of the flavour. These products are called pheny lindanes, and their bitterness is greater than that of the chlorogenic acid lactones.



PHENYL INDANE

Melanoidins are another class of compounds formed as a byproduct when coffee beans are roasted. They are formed by the chemical reaction between proteins and sugar (Maillard reaction).

Consumption of coffee has both pros and cons. However, it is always recommended to limit caffeine consumption as it is a potent drug and can have adverse effects on body.

CHEMISTRY IN MEDICINE

D. Tharini

I B.Sc. Chemistry

Major contributions to health care have been made by chemistry. The development of new drugs involves chemical analysis of new compounds. It involves many complicated chemistry processes. The chemistry also plays a major role in inventing medicine for new diseases. Many in the chemistry community are making their contribution to the global fight against corona virus. Chemistry based research institutions and companies of all sciences are refocusing their efforts towards discovering more about the virus, developing improved testing technologies and eventually creating a vaccine.

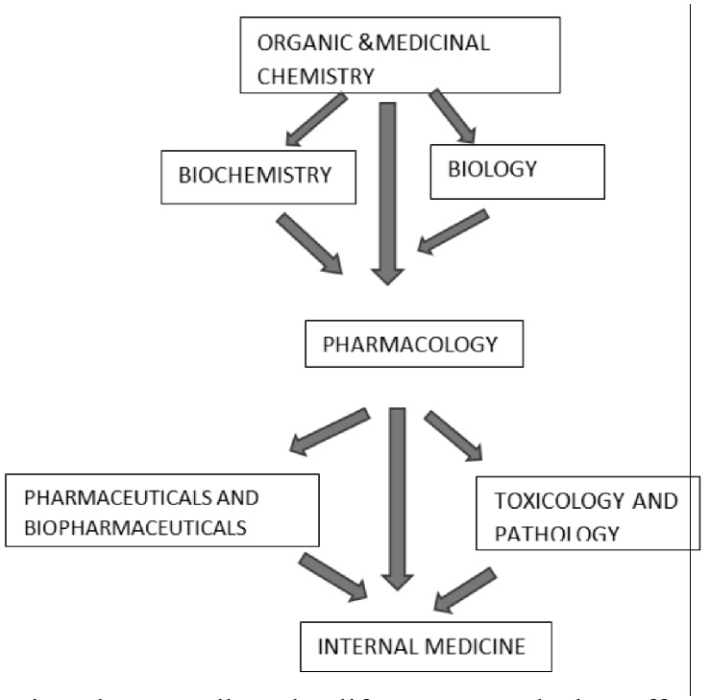
Significance of chemistry in medicine

1. In knowing the actual composition of the drug.
2. Understanding the chemical nature and properties of the drug.
3. Predicting the drug interactions in the body.
4. For sterilization and sanitation.
5. In the diagnosis of a disease.
6. To regulate the distribution of medicine inside the body compartments.
7. Decrease the toxic effects of drugs.
8. In discovery of new drugs or improve the potency of existing ones.
9. To study the mechanism of diseases.
10. To know how the drug acts into the body.

Role of organic, medicinal, pharmaceutical chemistry in drug design

Organic molecules perform key functions in nature, drug, and technology. It plays as the engine for understanding structure and reactivity. This science has found application in the production of molecules of commercial interest, in finding the innovative approaches to render this chemical science more efficient. The role played by organic chemists in pharmaceutical industry continues to be one of the main drives in the drug discovery processes.

Objective of medicinal chemistry is to design and produce compounds that can be used in medicine for prevention, treatment and cure of human or animal diseases. Nowadays, research development department of many organic and pharmaceutical laboratories are working for synthesis of newer pharmacophores having improved their potential in drug activity and increasing yields of existing drugs.



Finally, this chemistry has contributed to life process and taken efforts to advance the quality of life as well as to the development of society from synthetic, medicinal, biopharmaceutical, and industrial point of view.

Drugs are made of chemicals which are produced in pharmaceutical industries. The knowledge of chemistry is vital for pharmacists and doctors. The chemical nature of drugs also helps doctors to determine how drugs are going to interact with a patient's body. Chemicals are also used in sterilization, disinfection, and to kill microbes. Chemistry also helps pharmacists to understand biochemical mechanisms in a body.

WHO AM I?

Atheeba Firdouse

II B.Sc. Chemistry

1. At standard temperature and pressure I am nontoxic, nonmetallic, odorless, tasteless, colorless and highly combustible diatomic gas. Who am I?

2. I used to treat bipolar disorder and treat major depressive disorder. I reduce the risk of suicide. Who am I?

3. I am a soft metal and have a low melting point. I react quickly with water and also with snow and ice to produce sodium hydroxide and hydrogen. Who am I?

4. I am soft and white with silver lustre, I have low melting point and I am a good conductor of heat and electricity. I impart lavender colour to a flame and my vapour is green. Who am I?

5. I am very soft metal and one of the most highly reactive element in periodic table. I have a density about one and half times that of water and I am solid at room temperature. Who am I?

6. I react explosively with cold water and react with ice at temperature above -1160C. I am the most electropositive and most alkaline element. Who am I?

7. I am heavy, unstable, radioactive metal with a maximum half time of only 22 minutes. I am the second rarest element in the earth's crust. Who am I?

8. Scientists found me in the mineral of beryl and bertrandite. Who am I?

9. I have very good corrosion resistance and good high temperature mechanical properties. I react with water to produce hydrogen gas. Who am I?

10. I tarnish rapidly in air and react with water. I act as reducing agent in preparing other elements such as uranium and thorium. I am there in milk, yogurt, cheese. Who am I?

11. China is the leading producer of me. I am similar to calcium. I am a mineral found in sea water. Who am I?

12. My name comes from Greek word which means heavy. I am very important in petroleum industry. Who am I?

13. According to Encyclopedia, I am the heaviest alkaline earth metal. I will change my colour from silvery white to black when exposed to air, according to Lenntech due to oxidation. Who am I?

14. My low density is what causes balloons filled with gas to float, buoyed up by the denser surrounding air. Who am I?

15. I am colourless inert gas but I can change my colour to reddish orange in vacuum tube. I have the lowest liquid range of any element. Who am I?

16. I am the first discovered noble gas. My name comes from Greek word which means inactive. Who am I?

17. I am the rarest gas on earth composing only 1 part per million atmosphere by volume. I have full outer shell of electrons, rendering it largely inert to reactions with other elements. Who am I?

18. I was discovered shortly after discovering krypton and neon. They discovered me by evaporating liquid air. I am a trace element in the earth's atmosphere. Who am I?

19. I am the 5th radioactive element to be discovered. I am actually colorless but exude a brilliant yellow phosphorescence at temperature below my freezing point. Who am I?

20. I am the last element in the periodic table. I am radioactive and artificially produced element. Who am I?

For answers see page No. 13

FLOW CHEMISTRY

Kafula Linda

II M.Sc. Chemistry

FLOW CHEMISTRY, sometimes referred to as "continuous flow chemistry", "plug flow", or "microchemistry", is the process of performing chemical reactions in a tube or pipe. The reactive components are pumped together at a mixing junction and flowed down a temperature controlled pipe or tube.

Flow systems bring great advantages to chemical processes in terms of sustainability, efficiency and safety. It can be classified into four categories based on the type of reactions that are to be performed under the flow conditions.

There are different types of reactors used, these include

Glass Microreactors This offers excellent chemical resistance, high pressure, wide temperature range, high visibility and rapid mixing, volumes of 62.5 microliters, 250 and 1000 microliters.

Tube reactors This is ideal for longer residence times. They have volumes of 4ml, and 16ml. (also available in stainless steel for higher temperatures and pressure)

Column Reactors - Glass columns enable solid phase chemistry with the use of solid-supported reagents, catalysts. They are available in 0.7ml, 2.4ml, 5.6 and 12ml volumes.

Flow chemistry has been used for decades in the chemical industry. More recently, the pharmaceutical and fine chemical industries are increasingly adopting this technology. The inherent increase in safety, improved product quality, cost efficiency, and overall production flexibility are drivers for the growing use of flow chemistry.

Some of its uses include

- Continuous flow synthesis of Diphenhydramine Hydrochloride.
- Synthesis of Olanzapine
- Enantioselective continuous flow Michael additions.
- Continuous flow synthesis of Ibuprofen.

Advantages of continuous flow

The advantages of continuous flow production of fine chemicals when compared to traditional Batch Chemistry are

- Faster reactions.
- Safer reactions when handling hazardous materials The inventory of hazardous material being processed at any one time can be minimized in flow when compared with batch.
- Safer reactions involving gas evolution Reactions that evolve gas are much safer in flow as the maximum rate of gas evolution is limited by the rate at which the reagents are pumped.

- Safer reactions at high pressures Flow reactors do not require a head space. The pressure within the reactor is controlled by a device called a back pressure regulator (BPR) and not by pressurizing the gas within the head space as with traditional batch reactors. This eliminates the hazard associated with a volume of high pressure compressed gas / vapour.
- Reaction conditions simply not possible in batch reactors can be performed using flow chemistry.

Flow chemistry and manufacturing engineering have become largely acknowledged as viable and very often superior alternative to batch processing. Continuous flow techniques offer increased safety, scalability, reproducibility, automation, reduced waste and costs, and accessibility to a wide range of new chemical possibilities, seldom not accessible through classic batch chemistry. All these benefits widely fulfill most of the green chemistry principles, thus it is expected that flow chemistry and micro reactor technology could deeply change the way to perform sustainable chemical production in the near future.

MICROWAVING PLASTIC WASTE CAN GENERATE CLEAN HYDROGEN

L. Pricilla

II M. Sc. Chemistry

- India generates 9.46million tones of plastic waste annually or about 946,000 truckloads at 10 tonnes a truck. Nearly 40% of this waste remains uncollected, as per the environment ministry.
- Chemists have used microwaves to convert plastic bags, milk bottles and other supermarket packaging into a clean source of hydrogen.
- Plastic waste can already be converted to hydrogen using other methods and commercial facilities are being developed to transform the plastic.
- As the density of hydrogen in plastic bags is about 14 percent by weight, plastic offers a possible new source for countries eyeing cleanly produced hydrogen to tackle climate change.
- Most existing approaches involve first using very high temperature of more than 750degrees to decompose plastic into syngas, a mixture of hydrogen and carbon monoxide and then using a second step to separate out the hydrogen.
- Peter Edwards at the University of Oxford and his colleagues wanted to comfort the grim reality of plastic waste.
- Edwards and his team instead broke the plastic into small piece with a kitchen blender and mixed it with a catalyst of iron oxide and aluminium oxide.
- When blasted with a microwave generator at 1000 watts the catalyst created hot spots in the plastic and stripped out the hydrogen-recovering 97 percent of the gas in the plastic within seconds.
- The solid material left over was almost exclusively carbon nanotubes. The single-step approach has the advantage of just heating the catalyst, not all of the plastic, resulting in

FUN FACTS

S. Fathima Ramsha

II B.Sc. Chemistry

1. Every hydrogen atom in your body is likely 13.5 billion years old because they were created at the birth of the universe.
2. Mars is red because of iron oxide in it.
3. The chemical name for water (H_2O) is dihydrogen monoxide.
4. The only letter not appearing on the periodic table is J.
5. Although oxygen gas is colourless, the liquid and solid forms of oxygen are blue.
6. Chalk is made of trillions of microscopic skeleton fossils of plankton.
7. Lemons have more sugar than strawberries.
8. Frogs don't drink water because they can absorb it through their skin.
9. Your tooth enamel is the hardest chemical substance in your body.
10. You have taste buds on your cheek as well as on your tongue.

POWER GENERATION FROM RICE HUSK

K. Swetha

II M.Sc. Chemistry

As we learn, there are various sources to generate power. Even though a lot of methods are discovered that are not commercially available, these methods are not familiarized as they are expensive to operate. We know our population increasingyear after year and so is the demand for power consumption. The method described here is less expensve and easy to operate. As we know Asia is predominant producer of rice. In 2018-2019, INDIA alone produced 116.42 million metric tons of milled rice compared to other countries. These rice husks are disposed to land and being wasted. Scientists have found an alternative source of producing power from this rice husk as against the currently available methods of power generation such as Solar, Nuclear, Hydro and Wind powers.

Rice husk contains about 30-50% of organic carbon and have high heat value of 1316 MJ per kg. It can be used to generate fuel, heat, or electricity through thermal, chemical, or bioprocesses.

Rice husk is collected after rice milling, with moisture content of about 14-15%. This fits the requirement for further pretreatment or processing. Thermal processes, including combustion, gasification, and pyrolysis, are applied for rice husk processing. Energy products from rice husk are heat, electricity, and biofuel (solid or liquid). Heat generated from this could be used for house heating and cooking, industrial boilers, drying, and generating electricity.

OTHER USES OF RICE HUSK:

- Good fertilizer for plant growing. So more research is going on to wre this in agrochemistry.
- Replacement of cement by rice husk in building construction. Due to demand of M-sand production we can use this for constructing building.
- It is a good water purifier. Because it filters the arsenic impurities from water.
- It has high activated carbon. So, most of the chemical industries use this as adsorbent.
- It can be used as a vulcanizing agent for ethylene-propylene dieneterpolymer(EPDM).
- It has high amount of silica. So, it can be used in manufacturing of industrial chemicals such as silica, sodium silicate, zeolite and manufacturing refractory material such as SiC, Si_3Na_4.
- It can be used as releasing agent in the ceramics industry.

"POWER OF ASSOCIATION IS STRONGER THAN THE POWER OF BEAUTY;THEREFORE,THE POWER OF ASSOCIATION IS THE POWER OF BEAUTY"

BIOPLASTIC FOR SUSTAINABLE DEVELOPMENT

K. Kirthiga

II M.Sc. Chemistry

Bioplastics are plastic materials produced from renewable biomass sources such as corn, sugarcane etc.Historically, the very first plastic material used industrially by man were of natural origin. In 1926, Maurice Lemoigne(FL) developed polyhydroxybutyrate (PHB) from bacterium ***Bacillus megaterium.*** This was the first bioplastic made from bacteria.

Packaging Bioplastic packaging options include bags for compost, agricultural foils, horticultural products , nursery products , toys and textiles. There is a high demand for packaging made from bioplastics to be used for wrapping organic food as well as for premium and branded products with particular requirement.

Food services Eating and drinking on the go are the parts of life style, but with it comes increased waste that needs to be disposed of responsibly. Bioplastics are helping to reduce the impact of this waste on the environment , because food hygiene and safety must continue. They are used to make disposable catering service wares.

Medical Bio-degradable stents have shown great potential in reducing complication in patients. Nontoxic bio-degradable bioplastics sutures, commonly referred to as stitches, are now being used by medical professionals in hospitals and surgeries. The medical department uses bioplastics to make screws, pins, and plates, materials for pills and capsules.

Advantages

1. Lower fossil fuels consumption.
2. Decrease in waste generation.
3. Bioplastics save 30-80% of the greenhouse gas emission and provide longer shelf-life than normal plastics.
4. Lower energy cost in manufacture.
5. Less dependency on non-renewable resources.

Disadvantages

1. Need for costly equipment for both processing and recycling.
2. Biodegradable plastics produce methane in landfills.
3. It needs to be disposed in particular methods.

Plastics in different size accumulated in environment and take long time to break down. Whereas bioplastic end up with biodegradable or compostable materials which on treatment may give biofuels. Environmental as well as economic issues are addressed by bioplastics. Thus, bioplastics is a developing field of research for sustainable development.

NATURAL PLANT EXTRACTS AS INDICATORS IN VOLUMETRIC ANALYSIS

Sharon Roselin

I M. Sc. Chemistry

Titration is the most common laboratory method of quantitative chemical analysis that is used to determine the concentration of an analyte. The commonly used indicators for acid-base titrations are synthetic, and this work identifies the eco-friendly natural indicators and determines their pKa values. The selected flower extracts were found to perform well in titrating strong acid-strong base than in weak acid-strong base. A sharp and clear colour change from red to brownish yellow was obtained for the ***Bougainvillea glabra*** extract.

From red to yellow for the *Bauhinia purpurea* extract:

From red to brownish yellow for the *Impatiens balsamina extract*

Titration is the most common laboratory method of quantitative chemical analysis that is used to determine the concentration of an analyte. The commonly used indicators for acid-base titrations are synthetic, and this work identifies the eco-friendly natural indicators and determines their pKa values. The selected flower extracts were found to perform well in titrating strong acid-strong base than in weak acid-strong base. A sharp and clear colour change from red to brownish yellow was obtained for the ***Bougainvillea glabra*** extract.

THE MAGIC OF CHEMISTRY

K. S. Laxmi

II M.Sc. Chemistry

Do you believe in magic? And would you like to do one? Here's an idea.

Materials required

Test tube, Beaker, Vegetable oil

Procedure

Take a test tube, beaker and some vegetable oil. Pour vegetable oil in a test tube and also in the beaker (3/4th). Now immerse the test tube inside the beaker. The test tube becomes invisible. This is because of the refractive index of both oil and glass is 1.45 and as a result no reflection or refraction occurs at the surface of the test tube, making it invisible. At the end of the magic, you will see only the beaker with oil and not the test tube.

GREEN CHEMISTRY A STEP TOWARDS A SUSTAINABLE EARTH

J. Femila

II B.Sc. Chemistry

Green chemistry is the synthesis of substance in such a way that is proper, non-polluting and protected and which requires lowest amounts of resources and energy but generating slight or no waste material. Green chemistry is required to minimize the harm of the nature by anthropogenic materials and the processes applied to generate them. Scientists and Chemists can significantly minimize the risk to environment and health of human by the help of all the valuable ideology of green chemistry. The principles of green chemistry can be achieved by the use of environmentally friendly, harmless, reproducible solvents and catalysts during production of medicine, and in researches.

Green Dry Cleaning of Clothes

Percholoroethylene (PERC) is the solvent most commonly used in dry cleaning clothes. dichloroethylene is suspected to be carcinogenic and it contaminates ground water on its disposal. A new technology known as micelle technology is developed by Joseph De Simons, Timothy Remark and James Mc Clain in which liquid carbon dioxide can be used as a safer solvent along with a surfactant to dry clean clothes. This method is now being used commercially by some dry cleaners. Dry cleaning machines have been modified for using this technology so carcinogen PERC is replaced by green solvent.

Eco Friendly Paint

Oil based 'alkyd 'paints give off large amount of volatile organic compounds (VOCs) as it dries and cures. These VOC's have many environmental effects. Procter & Gamble and Cork composites & polymers established a mixture of soya oil and sugar to be used in place of petroleum, petrochemicals derived paints, resins and solvents which reduced the hazardous volatiles by 50%.

Chermpol MPS, paint formulation use these bio-based sepose oils to replace petroleum based solvents and create paint which is safer to use. Sherwin William established water based acrylic alkyd paints from recycled soda bottle plastic (PET), acrylics and soya bean oil. These paints give performance benefits of alkyds and low VOC content of acrylics.

Biodegradable Plastics

Large dumps of non biodegradable waste plastic have made earth unfit to live. Many companies have been working in this direction. For example, Nature Works of Minnetonka, Minnesota, is making food containers from polylactic acid branded as Ingeo. A method has been discovered by the scientists at Nature Works in which microorganisms convert cornstarch into a resin just as strong as the petroleum-based plastic presently used for making containers, water bottles etc. The company is trying to use the raw material from agricultural waste. In another example BASF developed a biodegradable polyester film called as Eco flex. This film is used along with cassava starch and calcium carbonate to make fully biodegradable bags called as Ecovio. The bags are certified by the Biodegradable Products Institute as completely biodegradable into water, CO_2, and biomass in industrial composting systems. These bags are also found to be tear-resistant, puncture-resistant, waterproof printable and elastic so can be used in the place of conventional plastic bags. They will quickly degrade in municipal composting systems along with kitchen and yard waste. So we can use this as an alternative to plastic bags.

Solar Cell

The solar cell is most important example of green technology. It directly converts the light energy into electrical energy by the process of photovoltaics. Solar photovoltaic technology has been found to be one of the few renewable, low-carbon producers with both the scalability and the technological development to congregate the ever-growing global demand for electricity. The use of solar photovoltaics has been rising at an average of 43% per year since 2000. Generation of electricity from solar energy results in less consumption of fossil fuels, reduction of pollution and greenhouse gas emissions. This is used in space technology as well as to power up houses too. By this we can reduce the expense.

Building with Green Technology

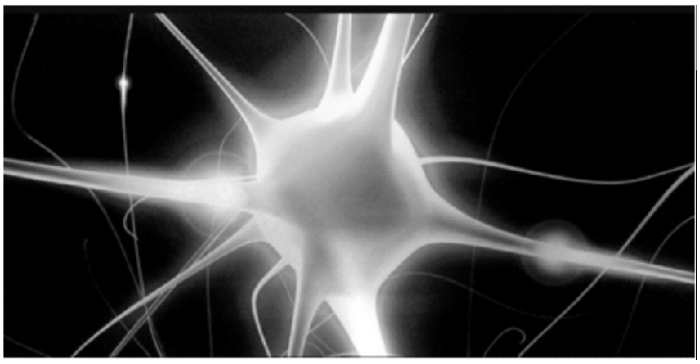
Green buildings make use of a variety of environmentally friendly techniques in order to reduce their impact on the environment. Use of domesticated materials, reflexive solar design, natural ventilation and green roofing technology may allow builders to construct a building with a significantly smaller carbon footprint than normal construction. These techniques are beneficial for the environment as well as they can produce cost-effective buildings which are healthier for the occupants too. Green ventilation techniques reduce the need for traditional air conditioning by allowing natural airflow. In Kerala a house has been built with coconut kernel. Not only it gives shelter but also absorbs rain water by this we can harvest rain water.

Though many exciting green chemical processes are being developed but there are far greater numbers of challenges lie ahead. A lot of efforts are being undertaken to design nonpolluting starting materials and to get safer products without side products. The greatest challenge is to incorporate the green chemistry in day to day life. Many successful efforts have to be made.

OPTICAL MAGNETIC FIELD SENSOR CAN DETECT SIGNALS FROM THE NERVOUS SYSTEM

Hemashree

II M.Sc Chemistry



- The human body is controlled by electrical impulses in the brain, the heart and nervous system.
- These electrical signals create tiny magnetic fields.
- Small magnetic fields from the human body can usually, only be picked up by very sensitive superconducting magnetic field sensor that have to be cooled by liquid helium to absolute zero (which in minus 273 degrees Celsius).
- The scientist, Niels Bohr developed a much cheaper and more practical optical magnetic field sensor that works at room temperature or at body temperature.
- The optical magnetic field sensor is based on a gas of Caesium atoms in a small glass container. Each Caesium atom is equivalent to a small bar magnet,which is affected by external magnetic fields.
- The atom and magnetic field are picked up using laser light.The method is based on quantum optics and atomic physics and can be used to measure in small magnetic fields.

Ultra sensitive magnetic field sensor

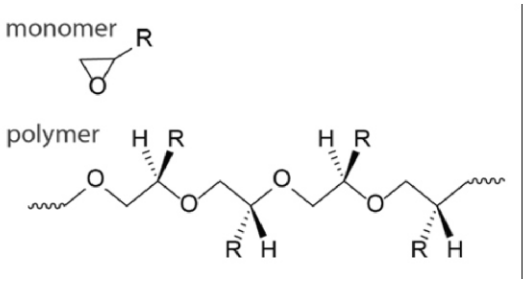
- The magnetic field sensor is made up of a glass container embedded with Caesium metal.
- The Caesium evaporates into gas at room temperature and the gas atoms rise up into the small channel in the sensor.
- Each Caesium atom is like a tiny bar magnet.
- The sensor is held close to a nerve, which emits an electrical nerve pulse.
- The electrical pulse has a magnetic field that causes a change in the tilt of the axes of Caesium atom and by sending a laser beam through the gas of ultra - small magnetic fields of the nerve signals.

- The sensor will be used for special medical examinations, it is important for the sensor not to be directly in contact with the body for dignosing heart problems in tiny foetuses.
- The magnetic field sensor is placed on the mother's abdomen and can easily and safely detect the heart beat of the foetus.

POLYMERS

S. Buela Srilekha

I B.Sc. Chemistry



The word "polymer" is derived from two Greek words, poly(many) by repeated linking of small molecules called "monomers". Example Polyethene is a polymer formed by linking together of a large number of ethane (C_2H_4) molecule. A polymer is a large molecule of high molecular weight obtained by the chemical interaction of many small molecules of low molecular weight of one or more type. The process of manufacture of a polymer is called the polymerization. Small molecules of low molecular weight, which combine to give a polymer are called monomers.The number of monomers used in the process is called degree of polymerization.The total number of functional groups or bonding sites present in a monomer molecule is called the functionality of the monomer.

Polymeric molecules are very big molecules. They are also known as macromolecules. Polymers are semi-crystalline materials. There are both amorphous and crystalline regions. In fact, polymers have regions of crystallinity, called crystallites, embedded in amorphous regions. Crystallites provide strength and hardness and the amorphous regions provide flexibility to the polymeric material. They are combustible materials and thermal as well as electrical insulators. Show excellent resistance to corrosion. Polymers are very light in weight with significant degrees of strength.

Based on their sources they are classified into

1. Natural polymers

   The polymers which are obtained from natural sources such as plants and animals are called natural polymers.

Examples : wood, cellulose, jute, cotton, wool, silk, proteins, natural rubber.

2. Synthetic polymers

   The polymers which are synthesized from simple molecules are called synthetic polymers.

Examples : Nylon 6, 6 PVC, polystyrene, teflon, plexiglass, polyesters, polyethylene etc

Based on their thermal behaviour they are classified into

1. Thermoplastic polymers

Examples : PVC, polyethylene etc.

2. Thermosetting polymers

Examples : Bakelite, urea-formaldehyde etc.

Based on their mechanism of polymerization, they are classified into

1. Addition polymers

Examples : PVC, polyethylene etc.

2. Condensation polymers

Examples : Nylon 66, polyester etc.

Based on their mechanism of polymerization, they are classified into

1. Elastomers

Examples : PVC, natural rubber

2. Fibres

Examples : Jute, wood, silk etc.

3. Resins

Examples : Urea-Formaldehyde, epoxy resins, phenol-formaldehyde etc,

4. Plastics

Examples : Plexiglass, PVC, teflon etc.

Based on the chemical structure

Linear (all the thermoplastics) branched (polystyrene) and cross-linked polymer (bakelite)

Branched

Examples : polystyrene, PMMA

Cross linked A bond that link one polymer chain to another.

Based on tacticity

The orientation of monomeric units in a polymer molecule can take place in an orderly or disorderly fashion with respect to the main chain. The difference in configuration do affect their physical properties.

Isotatic polymer

All the substituents are located on the same side of the macromolecules backbone.

Examples : polypropylene

Syndiotactic polymer

The substituents have alternate positions along the chain

Examples : Syndiotactic polystyrene

Atactic polymer

The substituents are at random around the main chain.

Examples : PVC

Polymerization is the process of conversion of low molecular weight substances into high molecular weight substances with or without the elimination of byproducts such as HCl, H_2O, NH_3 etc.

Types of polymerization

1. Addition (chain) polymerization

A polymerization reaction in which monomers containing one or more double bonds are linked to each other without the elimination of any byproducts, usually in the presence of initiators is called addition polymerization.

Examples : Formation of polythene.

$$nCH_2=CH_2 \rightarrow -[CH_2-CH_2-]_n$$

Condensation (step)polymerization

It is a process by linking together different monomers accompanied by the elimination of small molecules like H_2O, HCl, and NH_3.

Examples : Formation of Nylon66

$$n\ NH_2-(CH_2)_6-NH_2 + n\ HOOC-(CH_2)_4-COOH$$

Hexamethylene diamine Adipic acid

$$[-NH-(CH_2)_6-NH-CO-(CH_2)_4-CO-]_n + 2n\ H_2O$$

Nylon 6, 6

Classification Based on structure

Elastomers: Any rubbery material composed of long chain like molecules, or polymers, that are capable of recovering their original shape after being stretched to great extent. Example: Vulcanized Rubber

Fibres: When a polymer is drawn into long filament like material, whose length is 100 times its diameter, its called fibre.

Examples: Nylon-6, 6, cellulose, cotton

Resins: Low molecular weight polymers used as adhesives. They can be in the form of liquid or powders. Example Phenol formaldehyde, urea formaldehyde

Plastics: polymers which can be moulded into desired shapes by the application of heat and pressure (Examples: PE, PVC)

Types of Plastics

Thermoplastics

Plastics which soften on heating and harden on cooling. They retain their structure when subjected to heat and pressure. Hence they can be remoulded into new shapes without any loss of their physical properties. Examples PVC, polyethylene.

Thermosetting plastics

Plastics which get hardened during moulding process and cannot be softened by reheating. They also soften on heating but on standing acquire a cross linked structure which make them stable to heat. Thus they cannot be remoulded into new shapes. Examples Phenol formaldehyde, urea formaldehyde resin

Homopolymers and copolymers

Polymers formed from the same type of monomers are called homopolymers. Copolymers are formed by combining different monomers Example styrene butadiene copolymer. The chains of co-polymer consist of repeating units derived from each monomer. Following are some common types of copolymers.

(a) Alternating copolymers

(b) Block copolymers

(c) Random copolymers

(d) Graft copolymers

(A) Alternating copolymers

The different repeating units alternate in each chain. If A and B represent two different units then an alternating co-polymer will be represented as ABABAB…… The different repeating units alternate in each chain.

(b) Random Copolymers

In this type of copolymers, the different repeating units are not arranged in a systematic manner but are randomly arranged,

Example: commercial copolymers of butadiene and acrylonitrile

(c) Block Copolymers

In such copolymers, block of repeating unit of one type alternate with block of another type, Example: SBS (shoe soul)

(d) Graft Copolymers

In such co-polymers, blocks of one repeating unit are attached or grafted to a block of linear polymer.

QUIZ

S. Nithya

I M.Sc. Chemistry

1. Substance that speeds up a reaction without being consumed?
2. Chemical link that holds molecules together?
3. Reaction that takes in energy in the form of heat?
4. Gain of oxygen by a substance during chemical reaction?
5. An electron pair donoris known as------.
6. Substance which slows down or stops a chemical reaction?
7. Reaction that gives out energy in the form of heat?
8. Reaction in which two or more elements combine to form complex product?
9. Reactionwhich occurs when a substance reacts quickly with oxygen?
10. Reaction between an acid and base forming water and salts?

For answers see Page No. 40

CHEMISTRY LOVE POEM

Sr. Lowra

I B.Sc. Chemistry

I am attracted to you.
Like an electron to a proton.
Together we form an ionic bond.
Though we are opposite charged ions.
I am drawn towards you.
Our love is unique as an orbital.
Only two electrons can fill this gap.
As my love for you increases
My energy level rises
I am in this energized state.
Increasing the tendency to form a chemical bond
I was an element
It took you to me make a compound substance
Falling in love with you is a chemical reaction
Sometimes you do something especially nice
Which speeds up the chemical process.
Like a catalyst in my increasing love for you.
I realize we have our inhibition periods
And sometimes I am selfish enough
To be an endothermic reaction
Only absorbing your love.

PHEROMONE

K. S. Laxmi

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A pheromone is a chemical that an animal produces which changes the behaviour of another animal of the same species. It is also known as behaviour-altering agents.

Chemical pheromone communication between ants

Ants can produce scented chemicals also known as pheromones. Ants create pheromones from glands found all over their bodies. Their pheromones are used to communicate with their family.

Pheromones are detected at the tips of the ants super sensitive antennae, the left and right antennae tell the ant which way to turn with the varying pheromone strength. Ants that have missing or damaged antennae become disoriented.

There are about ten to twenty different (species dependent) pheromone perfumes, each represents a 'chemical word' that the entire colony understands. Pheromones can be used to summon a few ants to thousands of ants, depending on what is required. This may be the attacking of prey, the defending of the colony, the location of a sweet food source or the relocation of the colony, it works very well.

When an ant is squashed it releases a different pheromone that warns the others of potential danger.

Pheromones also help ants to distinguish between different family members, nest mates and strangers. The queen ant also has special pheromones that let workers her current status, and whether or not they need to begin raising new princesses and drones.

CHEMISTRY ASSOCIATION
UG Poster Presentation Competition on 12.10.2020

R. Kokila,
II B.Sc. Chemistry
I PRIZE

D. Sharmila,
I B.Sc. Chemistry: II PRIZE

P. Johncy,
II B.Sc. Chemistry: III PRIZE

RECYCLING OF PLASTICS

A. Aarthi
II B.Sc. Chemistry

Look around,
There's so much plastic,
Let's Recycle,
It's fantastic!

Don't forget about
Paper and glass
Recycle together,
With your entire class.

We'll make sure
We never litter,
Let's recycle
We are not quitters.

When we place our garbage,
In the right bin
Both us and nature
Will clearly win.

Thanks for keeping the environm
Healthy and clean,
Recycle is fun,
And also quite green.

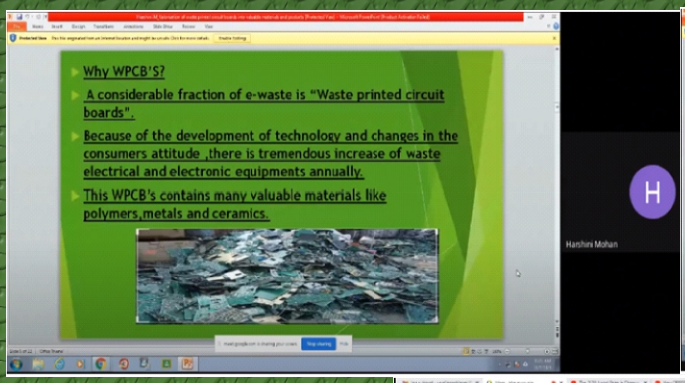
Answers
1. Catalyst
2. Bond
3. Endothermic
4. Oxidation
5. Lewis base
6. Catalyst poison
7. Exothermic
8. Complexation
9. Oxidation
10. Neutralization

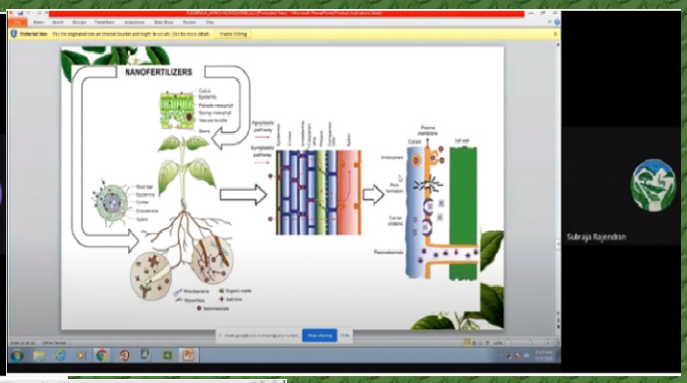
Nature - Drawing
A. Afrin Banu
II M.Sc. Chemistry

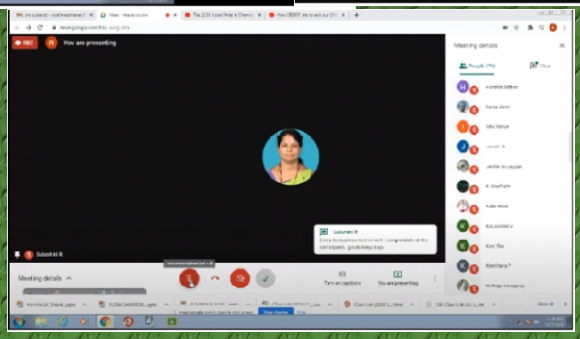
CHEMISTRY IN LIFE

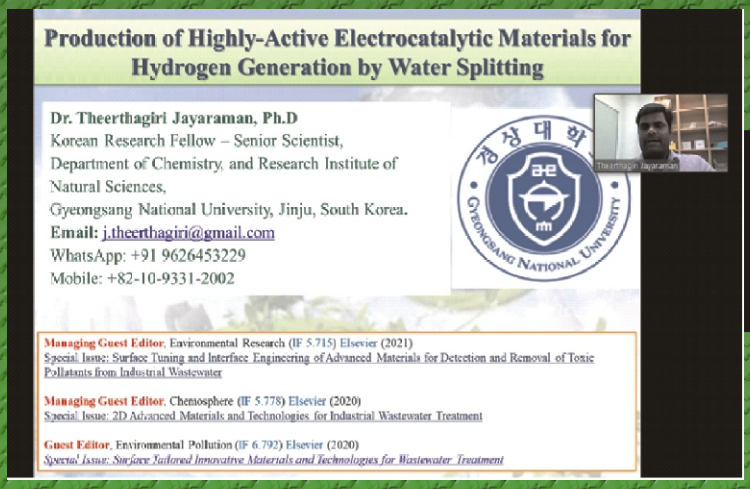
R. Subraja
II M.Sc. Chemistry

ONLINE PG PAPER PRESENTATION ON 07.11.2020









MADAME MARIE CURIE ENDOWMENT LECTURE 3
25 February 2021

UG QUIZ COMPETITION