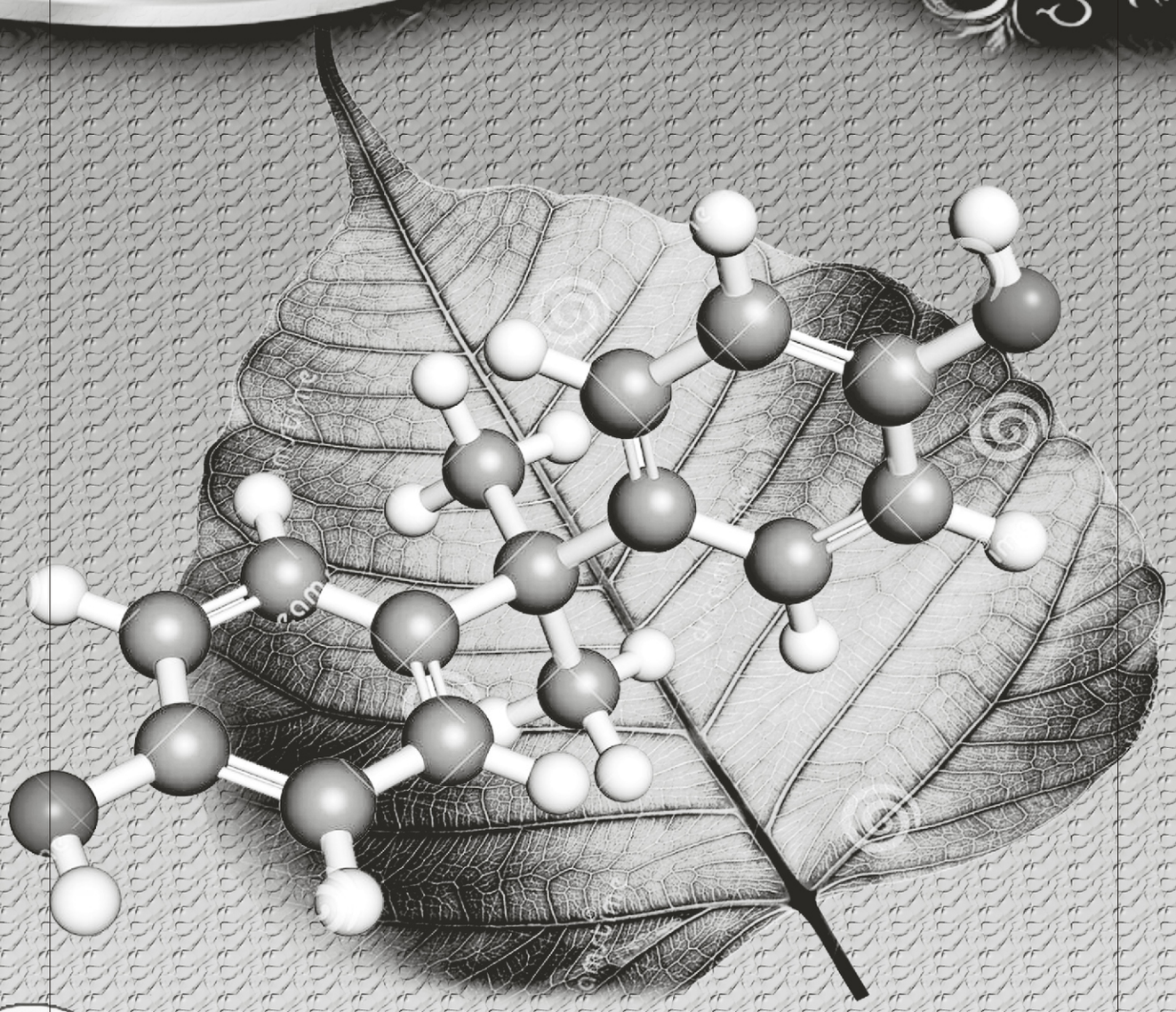
CHRYSLI

Vol XIV - 2018



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.

From the HOD's Desk...

"Education is not preparation for life; Education is life itself'. The Department of Chemistry established in the year 1957 has completed 60 years and it is with great joy and satisfaction I cherish my existence in the Department of Chemistry for the past thirty two years as a teacher and the past six years also as the Head of the Department. The dedicated and selfless services of the Former Principals and Heads of the Departments has inspired me a lot to work tirelessly in imparting education which is not preparation for life but becomes life for many.

The volumes of "CHRYSL" (CHemistry Resonating in Young Students Lives') released since 2005 treasured also brings back to my memory the times we have spent with students and staff. When eminent past pupils proudly say that they are preserving the edition in which they had contributed articles, it gives us a great sense of satisfaction. The Department has always taken interest in imparting quality education focussing on the fundemental science as well as applied science motivating the students towards research. Every issue and its content speaks volumes of the interest and hard work given by the students and staff. In this era where tons and tons of information can be downloaded, read through with great hurry, forgotten fast, I feel CHRYSL gives a platform to expose the writing and reading abilities of the students.

This academic year has also been a year to celebrate the Diamond jubilee of the Department. My wish for my students today and always is that chemistry works between them and the almighty to face life with its own challenges, limitations, ups and downs and also help them to develop a good chemistry between them and all those who associate with them in the famililies as well as their associates in the work place so that they live every moment of their lives happily focussing on their goals and endeavours to reach great heights. Hard work and sacrifice is always rewarded. Give your fullest in simple matters and God will bless you in abundance.

My congratulations to the student authors and the faculty members of our Department who take great interest in bringing out this periodical. May this work continue and let CHRYSL be transformed into a journal which publishes original research work in future.

Editorial

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

"Educating the mind without educating the heart is no education at all" said Aristotle. Education means "bring up" which is related to "bring out", "bring forth what is within" or "bring out potential" of the students. Students must be taught how to think and not what to think. Their talents and thinking can be showcased in the form of innovations, creativity, knowledge, skills and their writing abilities. CHRYSL magazine is a platform to express their creative pursuits.

The fourteenth edition of the magazine "CHRYSL" is a milestone that marks our growth, unfolds our imaginations and gives life to our thoughts and aspirations. It unleashes a wide spectrum of creative skills ranging from writing to editing and even of designing the magazine.

We express our sincere gratitude to our beloved Principal Dr. (Sr.) Mary Josephine Rani, for her unconditional support and guidance. Hearty congratulations to Dr. S. Jhancy Mary, Head of the Department, for the splendid spirit of harmony and her contribution has always been a catalyst to design the magazine to its best. We appreciate and thank our staff members for rendering their support in preparing the magazine. I hope this edition of CHRYSL would find a special place in the hearts of the readers. Wishing everyone an enriching and enjoyable reading through the articles.

Dr. V. Sugantha Kumari,
Assistant Professsor of Chemistry
&
Dr. R. Lakshmi,
Assistant Professsor of Chemistry

DIAMOND JUBILEE CELEBRATIONS

Inter Collegiate Debate

"சுற்றுப்புறச் சூழலைப் பாதுகாக்க" உடனடி தேவை
தனிமனித ஒழுக்கமா? சமூக ஒழுக்கமா?

Moderator
Dr. S. Ulaganayaki Palani,
Principal,
Annai Veilankanni's College for women, Saidapet

The inauguration of the Diamond Jubilee Celebration of the Department of Chemistry (1957-2017) was held on 07.10.2017. Dr. S. Ulaganayaki Palani, Principal, Annai Veilankanni's College for Women, Saidapet, Chennai was the chief guest and the judge for the debate. The programme started with an invocation song and a prayer dance. Dr. S. Ulaganayaki Palani, Dr. (Sr.) Mary Josephine Rani, Principal, Dr. (Sr.) Sheela Susai Raj, Vice Principal, Shift II, the RUSAC President, Dr. K. Geetha, Asso.Prof. and Head, Dept.of Chemistry, Muthurangam Govt. Arts College, Vellore and Dr. S. Jhancy Mary, Asso.Prof. and Head, Dept. of Chemistry, Auxilium College lighted the Kuthuvilakku. Dr. K. Geetha, President, RUSAC and Dr. A. E. Poornandhan, Asst.Prof of Chemistry, Muthurangam Govt.Arts College, Vellore and Secretary of RUSAC were also felicitated on assuming their office for 2017-2019.

The virtual release of balloons was initiated by Dr. (Sr.) Mary Josephine Rani, Principal. Dr. S. Jhancy Mary, Asso.Prof. and Head, Department of Chemistry, Auxilium College delivered the welcome address. Dr.(Sr.) Mary Josephine Rani, Principal offered her felicitations. Dr. K. Geetha felicitated and highlighted the activities of RUSAC. Ten students from various RUSAC colleges participated in the debate on a very interesting and apt topic of the day.

Dr. S. Ulaganayaki Palani headed the pattimanram and declared the prizes. The first prize comprising of the Diamond Jubilee Memorial Shield and a cash prize of Rs 1000/- was won by Miss S. B. Thilagavathy, II B.Sc. Chemistry, DKM College, Vellore. The second prize, a cash prize of Rs 500/- was won by Mr. P. Jeevanandam, II B.Sc. Chemistry, Sacred Heart College, Tirupathur. All the participants were given participation certificates. Dr. J. Roseline Ezhilarasi, Asso.Prof. of Chemistry proposed the vote of thanks.

National Seminar on "Recent Research in Chemical Sciences"

The Department of Chemistry, Auxilium College, established in the year 1957 has completed 60 glorious years in providing quality education. It is extremely gratifying that the department has reached great heights and realized its goals and objectives with the vision, "To inculcate a keen interest in learning Chemistry, acquiring skills in carrying out tasks systematically with perseverance and precision, motivating towards research, inspiring to lead a life with scientific approach and promote the standard of personal and societal living". As a full-fledged Department it offers UG, PG, M.Phil. and Ph.D.programmes.The Department is an active member of Rural Society for the Advancement of Chemistry (RUSAC) since 1987. A periodical CHRYSL (Chemistry Resonating in Young Students' lives) is being released annually since 2005. The Department focuses its research activities on thrust areas such as Polymer Chemistry, Phytochemistry, Nanochemistry, Synthetic Organic Chemistry and Coordination Chemistry. The Department has undertaken Major and Minor Research projects funded by UGC and DST. The Department conducts International, National, State level and Intercollegiate programmes periodically. The Department has a MoU with Thirumalai Chemicals Ltd., Ranipet.

To commemorate the Diamond Jubilee celebrations, the National Seminar on "Recent Research in Chemical Sciences - Diamond 18" was organized on 19.01.2018. Dr. (Sr.) Jayashanthi, Vice Principal, Auxilium College, delivered the welcome address. Rev. Sr. Amalorpavam, Secretary and Dr. (Sr.) Mary Josephine Rani, Principal, offered felicitations. Dr. (Sr.) Sheila Susairaj, Vice Principal (Shift II) and Mrs. R.M. Fathima Afroze, former Head of the Department graced the occasion. Dr. Scholastica Mary Vithiya presented the dynamics of the seminar. Dr. Richard Gonsalves, Vice Principal, St. Aloysius College, Mangalore gave the inaugural address and also delivered a resource lecture on "Recent Trends in Green Chemistry" which was very informative and was well appreciated by the participants. Mrs.B.K. Bama, Head, Quality Assurance, Thirumalai Chemicals Ltd., Ranipet, delivered a resource talk on "Advances in Gas Chromatography". She highlighted the basics as well as the latest hyphenated techniques in Chromatography and their applications.

Dr. Joby Thomas, Head, Department of Chemistry, St. Thomas' College, Thrissur, gave a lecture on "Photosensitizing Drugs" and also delivered the valedictory address. He explained the therapeutic applications of photosensitizing drugs. About 250 delegates participated in the seminar. Certificates of participation were distributed to all the participants by Dr. Joby Thomas. Dr. S. Jhancy Mary, Head, Department of Chemistry proposed the vote of thanks.

The Department has travelled a long fruitful journey of sixty years and acknowledges the contributions of all the former Principals, Heads, Staff, Lab Assistants who have worked tirelessly with commitment and dedication imparting the best education to its students with the blessings and the intercession of Mary our Help and in the foot prints of St Mary Mazzarello and St Don Bosco, the patron saints of the Salesian family.

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1. BRAIN CHEMICALS

How brain chemicals influence mood and health

At times we feel exhilarated and at times moody. Mood swings occur frequently or no reasons and we wonder why. This article focusses on a few common brain chemicals and how they impact your thinking and mood. The brain communicates with itself by transmitting chemicals from one neuron, or nerve, to the other. This regular, rapid-fire messaging plays a significant role in how you feel and function each day. These neurotransmitter chemicals are classified into two basic categories: excitatory, meaning they stimulate brain activity, or inhibitory, meaning they have a more calming effect. The four important brain chemicals are serotonin, dopamine, Glutamate and Norepinephrine.

Serotonin

Serotonin plays a role in sleep and in depression, but this inhibitory chemical also plays a major role in many of our body's essential functions, including appetite, and mood. Many antidepressants target serotonin receptors to improve the mood and lessen depressive symptoms. Serotonin is stored in the intestine and this chemical may play a role in digestive functioning as well.

Dopamine

Dopamine controls many functions, including behavior, emotion, and cognition. This chemical also communicates with the front part of our brain, which is associated with pleasure and reward. On the positive side, it helps motivate to work toward achieving a reward. However, many illegal drugs also target dopamine receptors, contributing to drug and alcohol addiction.

Glutamate

This is the most common excitatory neurotransmitter, found throughout the brain and spinal cord. Glutamate has many essential functions, including early brain development, cognition, learning, and memory.

Norepinephrine

It is also called noradrenaline, can sometimes act as a hormone as well. Its primary role is part of body's stress response. It works with the hormone adrenaline to create the “fight-or-flight” feeling. Norephinephrine may also be used as a drug to raise or maintain blood pressure in certain illnesses.

2. CHEMISTRY QUIZ

1. The metal that is usually extracted from sea water is
   Mg

2. Laughing gas
   Nitrous oxide

3. "Atoms can neither be created nor destroyed" This principle was given by
   John Dalton

4. Gas used in balloons
   Helium

5. Used as a fitter in rubber tyres
   Carbon black

6. Nail polish remover contains
   Acetone

7. Example of bactericidal anti biotic
   Penicillin

8. Helps in prevention of heart attack
   Aspirin

9. Main nitrogenous waste in humans
   Urea

10. Silk fibre chemically is
    Protein

11. Formation of ozone hole is maximum over
    Antarctica

12. Constituents of tear gas is
    Chloropicrin

13. Not a greenhouse gas
    Hydrogen

14. Used for artificial fruit ripening is
    Ethylene

3. CHEMISTRY POETRY

அரும்பை போல் சுறு சுறுப்பாய் இரு
என்பது பழமொழி பழையமொழி!
எலக்ட்ரானை போல் சுறு சுறுப்பாய் இரு
என்பது புதுமொழி புதிய மொழி!
நீ எலக்ட்ரான் போல் நெகட்டிவ் சார்ஜ் கொண்டாலும்
பாஸ்டிவ் திங்ஸ் விரும்பி செயல்படு!
வாழ்க்கை என்பது ஒரு வட்டம் என்றனர் அன்று
அந்த வட்டம் என்பது அணுவில் உள்ள ஆர்பிட்டலையே
குறிக்கும் என்பது இன்று!

4.THE EMERGENCE OF GREEN CHEMISTRY

Green chemistry is the use of chemistry for pollution prevention. More specifically, it is the design of chemical products and processes that are environmentally benign. Green chemistry encompasses all aspects and types of chemical processes that reduce negative impacts to human health and the environment. At its best, green chemistry is environmentally benign, linking the design of chemical products and processes with their impacts on human health and the environment. In the United States, the focus on Green Chemistry began in earnest after the passage of the Pollution Prevention Act of 1990. The U.S. Environmental Protection Agency established the Office of Pollution Prevention and Toxics (OPPT) to explore the idea of developing new or improving existing chemical products and processes to make them less hazardous to human health and the environment. The Office launched a research program called "Alternative Synthetic Pathways for Pollution Prevention".

Why Green Chemistry?

There is no doubt that our lives have been enhanced by chemistry. That is something chemists and students need to celebrate. However, environmental problems such DDT, ozone depletion, the Love Canal, Bhopal, and the Cuyahoga River are all too familiar examples of chemistry gone wrong. In responding to the growing concern, governments introduced regulations to limit pollution and exposure to hazardous chemicals and materials. Green chemistry represents a fundamental shift from this model toward a pollution prevention paradigm. The importance of green chemistry as an alternative in the developing world cannot be overstressed. Sustainable development depends on providing goods and services for a growing population without sacrificing environmental quality. Estimates from the United Nations put the world population as high as 10.7 billion people by 2050 and this nearly doubled population creates a huge demand for chemical goods and services in the near future. Much of the growth of the chemical industry is likely to take place in the developing world, coincident with the rising population. However, many of the global environmental impacts attributable to this population growth have ties to chemical processes or products:

* Loss of biological species in forests and in waters
* Ozone depletion
* Downstream pollution from unsustainable agricultural practices
* The pollution of fresh and marine waters, further depleting food sources
* The introduction of persistent organic pollutants into the ecosystem
* Changing climate, causing as yet unpredictable changes in the hydrologic cycle with manifestations in flood, drought, sea-level change, and the spread of infectious diseases.

5. DID YOU KNOW?

Here are some fun, interesting and sometimes **weird chemistry facts.**

- ✦ Did you know... you **can't taste food** without saliva.
- ✦ Did you know... it's possible to get sick or even die from **drinking too much water**.
- ✦ Did you know... liquid **oxygen** is blue.
- ✦ Did you know... fish scales are a common **lipstick ingredient**.
- ✦ Did you know... some **lipstick contains lead acetate** or sugar of lead. This toxic lead compound makes the lipstick taste sweet.
- ✦ Did you know... Coca Cola originally contained **cocaine**.
- ✦ Did you know... lemons contain **more sugar** than strawberries, for the same mass.
- ✦ Did you know... lobster blood is colorless until it is exposed to air. Then t**he blood appears blue**.
- ✦ Did you know... goldfish eyes perceive not only the visible spectrum, but also infrared and **ultraviolet light**.
- ✦ Did you know... when you **freeze saltwater slowly, you get freshwater ice**. Icebergs are freshwater, too, although that is because they come from glaciers, which are made from freshwater.
- ✦ Did you know... fresh **egg will sink in fresh water**. A stale egg will float.

- Did you know... **sound travels 4.3 times faster in water than in air**. Of course, it doesn't travel through vacuum at all.
- Did you know... about **78% of the average human brain** consists of water.
- Did you know... **a lightning strike** can reach a temperature of 30,000 ˚C or 54,000 ˚F.
- Did you know... **fire typically spreads uphill more quickly than downhill.** This is because temperature affects the rate of combustion. The region above a fire tends to be much hotter than the area below it, plus it may have a better supply of fresh air.
- Did you know... frogs don't need to drink water since they can absorb it through their skin. Humans, on the other hand, have **waterproofing proteins in their skin to help prevent water loss.**
- Did you know... the **hardest chemical** in your body is your **tooth enamel**.
- Did you know... **urine fluoresces** or glows under ultraviolet light.
- Did you know... **pearls, bones and teeth will dissolve in vinegar,** which contains weak acetic acid.
- Did you know... the chemical name for water **is dihydrogen monoxide.**
- Did you know... you can extend the life of rubber bands by storing them in the refrigerator.
- Did you know... **the ethylene gas** produced by a ripening apple ripens other apples as well as many other types of produce.
- Did you know... **water expands about 9%** when it freezes into ice.
- Did you know... **Mars is red because** its surface contains a lot of iron oxide or rust.
- Did you know... you've **lost about 1% of your body's water by** the time you feel thirsty.
- Did you know... it's possible **for hot water to freeze** more quickly than cold water.

Sr. Anita Dhar
I M.Sc. Chemistry

6. NEW INVENTIONS IN SCIENCE - 2017

Twenty five giant radio galaxies found

A team of six scientists has discovered the presence of a large number of what are known as giant radio galaxies (GRGs) across the universe. The galaxies have a super massive black hole, which could be even billions of times as massive as the sun, at their centre. Jets of charged particles are ejected from this black hole at very high speed, close to that of light. In fact, the jets reach out to distance even larger than the giant galaxies which host them, making the galaxy prominent when imaged with radio telescope. Nearly 200 new GRG candidates spread across the sky were found by the six researchers, most of whom were in institutes in Pune.

The significance of the discovery thus: "since GRGs extend to Mpc (megaparsec) scale (which is almost the size of a galaxy cluster), they can be used as probe of the medium between galaxies and clusters of galaxies. GRGs are very useful in understanding the growth and evolution of radio galaxies.

New material uses sunlight to detoxify water

Scientists have developed a new non toxic material that uses solar energy to degrade harmful synthetic dye pollutants which are released at a rate of nearly 300,000 tonnes a year into the world's water. The novel, non-hazardous photocatalytic material developed by researchers at Swansea university in the UK effectively removes dye pollutants from water, adsorbing more than 90% of the dye and enhancing the rate of dye breakdown by almost ten times using visible light. The composite is synthesized by growing ultra thin "nanowires" of tungsten oxide on the surface of tiny particles of tantalum nitride.

Demystifying science

$\mathbf{Xi}_{cc}^{++}$

It's a new kind of quark, or a subatomic particle, that is a basic building block of matter. It was observed by physicists working at the large hardon collider facility in Geneva. Nearly all the matter that we see around us is made of baryons, which are common particles composed of three quarks, the best-known being protons and neutrons. But there are six types of quark- top, bottom, up, down, charm, and strange. Theoretically many different potential combinations could form other kinds of baryons. Unlike a proton, which is made up of only up and down quarks, the new entity has two charm quarks. The mass of newly identified particle is about 3621MeV, which is almost four times heavier than the proton.

A boost for gene therapy for cancers

Researchers at Kyoto University's Institute for integrated cell- material science in Japan have developed a new method that modifies the surface of nanorods, making them more efficient in transporting cancer killing genes into cells. The team has also developed a gene carrier, known as a plasmid vector, which includes a 'heat shock protein' that is activated in response to heat. First, the vector is bound to the 'enhanced green fluorescent protein' (EGFP) gene, and then transferred into mammalian cells by the lipid coated gold nanorods. Exposing cells to near infrared laser for 10 seconds heated up the gold nanorods, turning on the EGFP gene. Surrounding, non-targeted cells shows little to no EGFP expression. The lipid coated gold nanorods could potentially help with molecular cancer therapies.

7. TARGETED DRUG DELIVERY

Targeted drug delivery system is based on a method that delivers a certain amount of a therapeutic agent for a prolonged period of time to a targeted diseased area within the body. This helps maintain the required plasma and tissue drug levels in the body; therefore avoiding any damage to the healthy tissue. This targeted delivery is largely found on nano particle mediated drug delivery in order to combat the downfalls of conventional drug delivery. These nanoparticles would be loaded with drugs and targeted to specific parts of the body where there is solely diseased tissue, thereby avoiding interaction with healthy tissue. There are two types of targeting methods :

a. Passive targeting

In passive targeting the drug's success is directly related to circulation time. This is achieved by cloaking the nanoparticle with some sort of coating. Several substances can achieve this, with one of them being polyethylene glycol (PEG). By adding PEG to the surface of the nanoparticle, it is rendered hydrophobic, thus allowing water molecules on PEG via hydrogen bonding. Due to hydrophobic interactions, thus the drug-loaded nanoparticle is able to stay in circulation for a longer period of time.

b. Active targeting

This active targeting approach can be further classified into three different levels of targeting which are 1) First order targeting refers to restricted distribution of the drug carrier systems to the capillary bed of a predetermined target site, organ or tissue. 2) Second order targeting refers to selective delivery of drugs to specific cell types such as tumour cells and not to the normal cells. 3) Third order targeting refers to drug delivery specifically to the intracellular site of targeted cells.

Drug delivery vehicles

Drug delivery vehicles are also referred as drug vectors which are most important entity required for successful transportation of the drug. Drug vectors transports and retains the drug to be delivered it within or in the vicinity of target. They are made capable of performing such specific functions which can be attributed by slight structural modifications.

Liposomes

Liposomes are small artificially designed vehicles composed of phospholipid bilayers surrounding with the size ranging from 20 to 10,000 nm. Many liposomes formulations are rapidly taken up by macrophages-specific delivery of drugs or for passive drug targeting which allow slow release of the drug over time from these cells into the general circulation.

Biodegradable particles

Biodegradable particles have the ability to target diseased tissue as well as deliver their payload as controlled release therapy.

Artificial DNA nanostructure

The success of DNA nanotechnology in constructing artificially designed nanostructures out of nucleic acids such as DNA, combined with the demonstration of systems for DNA computing, as led to speculation that artificial nucleic acid nano devices can be used to target drug delivery based upon directly sensing it's environment.

Applications

Targeted drug delivery can be used to treat many diseases such as the cardiovascular diseases and diabetes. However, the most important application of targeted drug delivery is to treat cancerous tumors. Stem cell therapy can be used to help regenerate myocardium tissue and return the contractile function of the heart. Liposomes can be used as drug delivery for the treatment of tuberculosis.

I M.Sc. Chemistry

8. REMEMBERABLE RECORDS OF CHEMISTRY

1. Most conductive metal- Silver
2. Most conductive non-metal- Graphite (Allotrope of carbon)
3. Most poisonous element- Plutonium
4. Most electropositive element- Caesium (instable element)
5. Most electropositive radioactive element-Francium
6. Most electrovalent compound- Caesium Fluoride
7. Most stable carbonate - Caesium carbonate
8. Most strong base - Caesium hydroxide
9. Most strong reducing agent- Lithium
10. Most strong reducing agent among the hydrogen halides -Hydrogen Iodide
11. Most inflammable gas-Hydrogen
12. Most abundant element in earth's crust-Oxygen
13. Most abundant gas in atmosphere - Nitrogen (78%)
14. Hardest naturally occurring substance-Diamond
15. Least electropositive element-Fluorine
16. Lightest known element-Hydrogen
17. Lightest solid element-Lithium
18. Lightest gaseous non-metal-Hydrogen

II M.Sc. Chemistry

9. CHEMISTRY FACTS

Lightning strikes produce Ozone, hence the characteristic smell after lightning storms

Ozone (O_3), the triple oxygen molecule that acts like a protective stratospheric blanket against ultraviolet rays, is created in nature by lightning. When it strikes, the lightning cracks oxygen molecules in the atmosphere into radicals which get converted to ozone. The smell of ozone is very sharp and that is why we get the smell after a thunderstorm.

Water expands when freezes, unlike other substances

When something is cold, it shrinks because temperature describes atomic vibration- the more vibration, the more space it takes, hence expansion. Water is an exception. Even though it vibrates less when it is frozen, the ice occupies more volume. It is due to the strange shape of the water molecule. The water molecule looks like Mickey Mouse, the oxygen atom sitting at the center (the face) and two hydrogen atoms each at an angle (Mickey's ears). The water molecule is an open structure with a lot of space. When water freezes it releases energy because lots of extra strong bonds can be made. But it does take up more space. And so, ice expands when it freezes. Hot water freezes faster than cold water.

Super fluid Helium defies gravity and climbs on walls

A remarkable transition occurs in the properties of liquid helium at the temperature 2.17K (very close to absolute zero), called the “lambda point” for helium. Part of the liquid becomes a “superfluid”, a zero viscosity fluid which will move rapidly through any pore in the apparatus.

If you pour a handful of salt into a glass of water, the water level will go down

When you step inside a bath tub, the water level will immediately go up, per Archimedes law. But when you add a volume of sodium chloride (salt) to a volume of water, the overall volume actually decreases by up to 2%. The net reduction in observed volume is due to solvent molecules which become more ordered in the vicinity of dissolved ions.

DNA is a flame retardant

Coating cotton cloth with DNA, researchers found the genetic material reduced the fabric's flammability. When it is heated, the phosphate from DNA produces phosphoric acid which replaces the water in cotton fibers as a flame-retarded residue. The bases, which contain nitrogen, react to produce ammonia which inhibits combustion.

One inch of rain is equal to 10 inches of snow

When the temperature is around 30° F, one inch of liquid precipitation would fall as 10 inches of snow - assuming the storm is all snow. Your car's airbags are packed with sodium azide salt, which is very toxic.

When a collision takes place, the car's sensors trigger an electrical impulse which in the fraction of a second dramatically raises the temperature of the salts. These then decompose into harmless nitrogen gas, rapidly expanding the airbag.

10. 3D PRINTING PENS

Max bogue and Peter diworth have invented a unique pen that draws in air. The pen is called **"3 D DOODLER".** The weight is approximately of 7 ounces and 7 inches long.

Working

The color spool of plastic thread is fed into the pen. The thread is then extruded as heated plastics that cooled through patented process while moving through the pen, which can then be used to make 3 D objects by hand.

Materials used for 3Dprinting pen

Acrylonitrile butadiene styrene (ABS)

Poly lactic acid(PLA)

FLEXY

Thermal polyurethane (TPU)

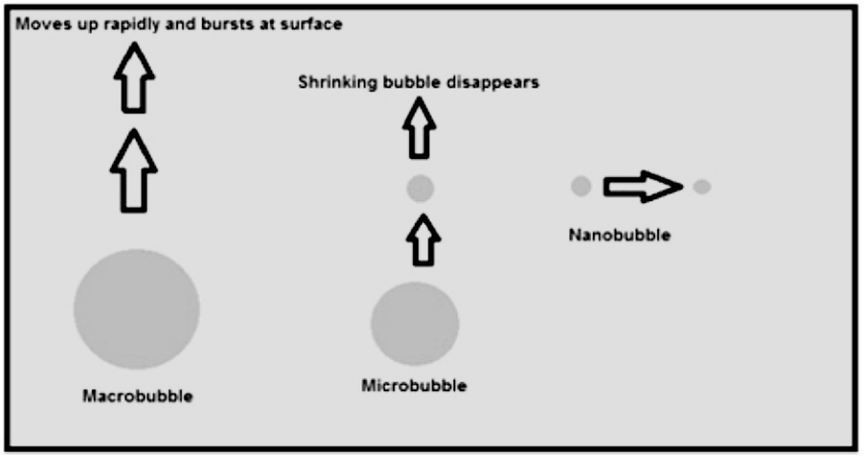
Uses:

Modifying and repairing of other plastic objects

11. NANOBUBBLES

Nanobubbles have a wide range of potential applications. Nanobubble has been used for detergent-free cleaning, ultra-sound imaging and intracellular drug delivery, enhanced drug susceptibility of cancer cells, and mineral processing etc. Nanobubbles can be used as cleaning agents both for the prevention of surface fouling and for defouling surfaces. In particular nanobubbles produced by electrochemical treatment can be used to remove proteins that are already adsorbed to a surface. Gold nanobubbles are used for the purpose of drug delivery inside cancer cells. Nanobubbles can be used as an effective means for gene delivery without the use of viruses. Nanobubbles generated by hydrodynamic cavitation were found to improve coarse particles and fine particles flotation performances and reduce reagents consumption. The bridging of bubbles between hydrophobic surfaces favors fine particle flotation. The influence of nanobubbles/nanopancakes on the floatation of mineral and coal in saline environment is important due to the dramatic changes on the surface characteristics of the mineral species. Nanobubbles can be used as an effective means to treat wastewater.

Micro-nano-bubbles (MNBs), with diameters ranging from tens of nanometres to tens of micrometres, present rapid mass transfer rates, persist for a relatively long time in water, and transport with groundwater flow, which significantly improve gas concentration and provide a continuous gas supply. Therefore, MNBs show a considerable potential for application in ground water remediation.



12. CHEMISTRY NOBEL PRIZE WINNERS IN 2017

The legends who won noble prize for developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution in 2017 are

Jacques Dubochet ***Joachim Frank*** ***Richard Henderson***

Their work was simplification and improving the imaging of biomolecules. This method has moved biochemistry into a new era. A picture is a key to understanding. Scientific break throughs often build upon the successful visualisation of objects invisible to the human eye. However, biochemical maps have long been filled with blank spaces because the available technology has had difficulty generating images of much of life's molecular machinery. Cryo-electron microscopy changes all of this. Researchers can now freeze biomolecules mid-movement and visualise processes they have never previously seen, which is decisive for both the basic understanding of life's chemistry and for the development of pharmaceuticals.

Electron microscopes were believed to only be suitable for imaging dead matter, because the powerful electron beam destroys biological material. But in 1990, Richard Henderson succeeded in using an electron microscope to generate a three-dimensional image of a protein at atomic resolution. This breakthrough proved the technology's potential.

Joachim Frank made the technology generally applicable. Between 1975 and 1986 he developed an image processing method in which the electron microscope's fuzzy two dimensional images are analysed and merged to reveal a sharp three-dimensional structure. Jacques Dubochet added water to electron microscopy. Liquid water evaporates in the electron microscope's vacuum, which makes the biomolecules collapse. In the early 1980s, Dubochet succeeded in vitrifying water, he cooled water so rapidly that it solidified in its liquid form around a biological sample, allowing the biomolecules to retain their natural shape even in vacuum.

Thara Prasannan
II M. Sc. Chemistry

13. MNEMONIC DEVICES FOR THE PERIODIC TABLE

Here is a simple technique to help chemistry students remember the elements in the periodic table. Do enjoy the fun.

1. Group 1A (H, Li, Na, K, Rb, Cs, Fr)

   Highly Nasty Kids Rub Cats Fur

2. Group 2A (Be, Mg, Ca, Sr, Ba, Ra)

   Beer Mugs Can Serve Bar Rats.

3. Group 3 (B, Al, Ga, In, Tl)

   Big Al Gave Innocent Toys.

4. Group 4A (C, Si, Ge, Sn, Pb)

   Can Silly Germans Snatch Lead?

5. Group 5 (N, P, As, Sb, Bi)

   New Popes Assign Subordinate Bishops.

6. Group 6A (O, S, Se, Te, Po)

   Old Soldiers Seem Terribly Polluted.

7. Group 7A (F, Cl, Br, I, At)

   Fairy Clowns Broil Innocent Ants.

8. Group 8A (He, Ne, Ar, Kr, Xe, Rn)

   He Never Arrived; Karen eXited with Ron.

9. First Row Transition Metals (Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn)

   Scott Tips Very Counterfeit Money, Feels Cold Near Cubic Zircons.

10. Second Row Transition Metals (Y, Zr, Nb, Mo, Tc, Ru, Rh, Pd, Ag, Cd)

    Yes, Sir Nob. Most Technicians Rub Rod's Pale Silver Cadillac.

11. Third Row Transition Metals (La, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg)

    Larry's Half Taken, Wendy Reached Out Her Plate Audibly, Helga.

Lanthanides (Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu)

12. Caesar Procrastinated at the Nile, Permitting So Many Europeans (who were) Getting Turbid (and) Dying (of) Home Urges [Erges] To Yell "Lutetium!"

13. Actinides (Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr)

    Three Planets: Uranus, Neptune, (and) Pluto. Amy Cured Berkeley, California. Einstein (and) Fermi Made Noble Laws.

R. Preethi
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14. MPEMBA EFFECT

Have you ever wondered whether hot water really can freeze more quickly than cold water and if so, how it works? If so, then you need to know about the Mpemba effect. Simply stated, the Mpemba effect is the name given to the phenomenon when hot water freezes more quickly than cold water. Although the effect has been observed for centuries, it was not published as a scientific observation until 1968.

The Mpemba Effect is named for Erasto Mpemba, a Tanzanian school boy who claimed ice cream would freeze faster if it was heated before being frozen. Although his peers ridiculed him, Mpemba got the last laugh when his instructor performed an experiment, demonstrating the effect. Mpemba and the headmaster Dr. Denis G. Osborne observed the time required for freezing to start took longest if the initial water temperature was 25 °C and took much less time if the starting temperature was 90 °C.

Reasons Why the Mpemba Effect Happens

Scientists are not completely certain why hot water sometimes freezes more quickly than cold water. The explanation for the effect likely has to do with impurities in the water, which serve as nucleation sites for freezing. Other factors may include:

* An effect from the evaporation of hot water
* Increased convection in hot water
* Increased tendency of cold water to super cool compared with hot water
* Potential different amounts of dissolved gases in cold water compared with hot water
* Effect of frost formation - hot water tends to freeze from the bottom while cold water tends to freeze from the top
* Thermal conductivity, causing the container of hot water to melt through insulating ice in the freezer, potentially exposing the container to a colder layer beneath the ice

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15. HOW TO LEARN CHEMISTRY EASILY?

Chemistry can be a tough and volatile subject to learn, especially if you are not going about studying this complicated subject in the right way. While there are no secret shortcuts to help you master chemistry overnight, you can make it easier by studying the right way. Once you know the best ways to spend your study time and prepare for lessons, you can focus on understanding the concepts better.

1. Memorize the Periodic table

Learning the elements is essential to succeed in chemistry. A band called Asap SCIENCE has a 3 minutes song called "The new periodic table song" that may help memorize the periodic table easily. Read Article No 13 in this issue of CHRYSL to remember the elements.

2. Study all the core concepts and learn how to solve problems step by step

This would begin with the basics of learning measurement systems, the scientific method, chemical nomenclature and atomic structure.

3. Think three dimensionally

You are trained to read the textbook with 2D drawings of molecules, but keep in mind that chemistry is in the 3D world. Use a 3D model or train your mind to picture any molecular structure in 3D. Now that all lessons delivered by great teachers are available in You tube , listen to them when you are free.

4. Learn mnemonic memorization techniques

Try thinking of each element as a different symbol, such as apple or a football. It can be anything you can picture in your mind when you think of the element. It may seem counter-intuitive, but by creating strong associations you will have an easier time remembering information.

5. Brush up on your maths

There are number of equations and formulae that you need to solve in order to learn chemistry.

6. Make flashcards

Anytime you learn a new word or concept, make a flashcard for it. This is great for the periodic table as well as many other principles.

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16. BIODIESEL MADE WITH SUGAR CATALYST

The production of diesel from vegetable oil is made efficient by using solid catalyst to make the process fully eco friendly. The preparation of such a catalyst from common, inexpensive sugars is feasible. This high-performance catalyst, which consists of stable sulphonated amorphous carbon, is recyclable and its activity markedly exceeds that of other solid acid catalysts tested for 'biodiesel' production. The esterification of higher fatty acids by liquid acid catalysts such as sulphuric acid (H_2SO_4) is a process commonly used for biodiesel production, but it involves high consumption of energy and the separation of the catalysts from the homogeneous reaction mixtures is costly and chemically wasteful.

Recyclable solid acids, such as Nafion, make better catalysts, although they are also expensive and their activity is less than that of liquid acids. Sulphonated naphthalene carbonized at 200-250 C is a solid acid catalyst that has been used successfully for ethyl acetate formation. However, it is a soft material and its aromatic molecules are leached out during liquid-phase reactions above 100 C or when higher fatty acids are used as surfactants, so its catalytic activity is rapidly lost. A strategy has been devised to overcome these problems by sulphonating incompletely carbonized natural organic material to prepare a more robust solid catalyst. Incomplete carbonization of natural products such as sugar, starch or cellulose results in a rigid carbon material that is composed of small polycyclic aromatic carbon sheets in a three-dimensional sp3 bonded structure. Sulphonation of this material would be expected to generate a stable solid with a high density of active sites, enabling a high-performance catalyst to be prepared cheaply from naturally occurring molecules. First, D-glucose and sucrose are incompletely carbonized at low temperature to induce pyrolysis and the formation of small polycyclic aromatic carbon rings; sulphonite groups (SO_3H) are then introduced by sulphuric acid. Structural analysis indicates that the prepared samples consist of sheets of amorphous carbon bearing hydroxyl and carboxyl (OH and COOH) groups, as well as high densities of SO_3H groups. This black powder is insoluble in water, methanol, benzene, hexane, N,N-dimethylformamide and oleic acid, even at boiling temperatures. It can be moulded into hard pellets or thin flexible films by heating with binding polymer; the two forms have comparable stability and catalytic performance. The thin films act as electrically insulating proton conductors whose properties are comparable to that of Nafion.

High-grade biodiesel is produced by esterification of the vegetable oil constituents oleic acid and stearic acid. The activity of solid sulphonated carbon catalyst in this reaction is much higher than can be achieved by conventional solid acid catalysts .There is no loss of activity or leaching of SO_3H during the process, even for samples subjected to repeated reactions at 80-180 C after having been recovered by simple decantation. Saccharide molecules may therefore be generally suitable for preparing these catalysts, which can be used as a replacement for liquid sulphuric acid in esterification reactions. In addition to biodiesel production, such environmentally benign alternative catalysts should find application in a wide range of other acid catalysed reactions.

17. RADIOACTIVE ELEMENTS

Uranium is used by the military to power nuclear submarines and in nuclear weapons. Depleted uranium is uranium that has much less uranium 235 than natural uranium. It is a dense metal that can be used as ballast for ships and counterweights for aircraft.

Thorium was formerly used as an alloying element in TIG welding electrodes, as a material in high-end optics and scientific instrumentation, and as the light source in gas mantles, but these have become marginal uses.

Radium was used in medicine to produce radon gas which was used in a cancer treatment. This can be used in cancer, anemia, and genetic mutations.

Plutonium was used in several of the first atomic bombs, and is still used in nuclear weapons. Plutonium is also a key material in the development of nuclear power.

Radon was used in some hospitals to treat tumours by sealing the gas in minute tubes, and implanting these into the tumour, treating the disease in situ.

Polonium is used as a source of heat for space equipment. It can be mixed or alloyed with beryllium to provide as a source of neutrons.

Americium-241 has been used as a portable source of both gamma rays and alpha particles for a number of medical and industrial uses.

Caesium is used as the function of a drilling fluid is to lubricate drill bits, to bring rock cuttings to the formation during drilling of the well.

Actinium is highly radioactive and was therefore studied for use as an active element of radio isotope thermoelectric generators.

Technetium -99m is a radioactive tracer medical imaging equipment tracks in the human body.

Strontium covers areas of chemistry, nutrition, toxicity, transport across biological membranes, homeostasis, general physiology, calcium-strontium interactions, and particularly the role of strontium in bone.

Promethium is used only for research purposes, except for promethium-147, which can be found outside laboratories. Some signal lights use a luminous paint, containing a phosphor that absorbs the beta radiation emitted by Promethium-147 and emits light.

Californium is useful as a neutron startup source for some nuclear reactors and as a portable neutron source for neutron activation analysis to detect trace amounts of elements in samples.

Francium has been used for the research purpose in the fields of chemistry and atomic structure. Its use as a potential diagnostic aid for various cancers has also been explored.

Lutetium has been proposed for use as a lens material in high refractive index immersion lithography.

18. NEW TREND OF GRAPHENE

Carbon is the sixth element of the periodic table and the first element of the group 14 (or IVA). Diamond and graphite are the most famous allotropes of carbon, which have long histories of many applications due to their hardness and softness, respectively. Carbon can also generate long chains, so-called catenation, resulting in the formation of diverse organic compounds, including biomolecules. The small size of carbon and its electronic structure make carbon an exceptional element capable of producing versatile structures with appealing properties.

Graphene is a two-dimensional (one-atom-thickness) allotrope of carbon with a planar honeycomb lattice. It is regarded as the basic building-block of carbon nanotubes and large fullerenes. The properties of carbon nanotubes originate from graphene sheets. The infinite plane of a perfect graphene shows a zero electronic band gap with electrons having zero effective mass where valance and conduction bands meet. This makes graphene an anomalous material, which does not behave as either a metal or a semiconductor. A single graphite sheet consisting of a honeycomb lattice structure of sp^2 bonded carbon atoms.

Graphene exhibits a number of exotic physical properties, previously not observed at the nanoscale. The observation of room-temperature quantum Hall Effect, ultrahigh electron mobility and ballistic transport, long electron mean free paths, superior thermal conductivity, great mechanical strength, and remarkable flexibility are among the striking properties of graphene.

19. DNA AND ITS STRUCTURE

Deoxyribonucleic acid or DNA is a molecule that contains the instructions an organism needs to develop, live and reproduce. These instructions are found inside every cell, and are passed down from parents to their children. DNA is made up of molecules called nucleotides. Each nucleotide contains a phosphate group, a sugar group and a nitrogen base. The four types of nitrogen bases are adenine (A), thymine (T), guanine (G) and cytosine (C). The order of these bases is what determines DNA's instructions, or genetic code. Human DNA has around 3 billion bases, and more than 99 percent of those bases are the same in all people, according to the U.S. National Library of Medicine (NLM).

Similar to the way the order of letters in the alphabet can be used to form a word, the order of nitrogen bases in a DNA sequence forms genes, which in the language of the cell, tells cells how to make proteins. Another type of nucleic acid, ribonucleic acid, or RNA, translates genetic information from DNA into proteins. Nucleotides are attached together to form two long strands that spiral to create a structure called a double helix. If you think of the double helix structure as a ladder, the phosphate and sugar molecules would be the sides, while the bases would be the rungs. The bases on one strand pair with the bases on another strand: adenine pairs with thymine, and guanine pairs with cytosine.

DNA molecules are long that they can't fit into cells without the right packaging. To fit inside cells, DNA is coiled tightly to form structures called chromosomes. Each chromosome contains a single DNA molecule. Humans have 23 pairs of chromosomes, which are found inside the cell's nucleus.

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20. THREATS TO CORAL REEFS: THE EFFECTS OF CHEMICAL POLLUTION

Coral reefs can be seriously affected by leaking fuels. Spills may not affect corals directly if the oil stays near the surface of the water, as much of it evaporates within days. However, when corals are spawning, the eggs and sperm can be damaged as they float near the surface before they fertilize and settle. In shallow waters the water accommodated fraction (WAF) may disrupt reproduction. However, dispersed oil in combination with the dispersing detergents is significantly more toxic than the WAF of crude oil alone. Dispersants and WAFs plus dispersants cause larval morphology deformations, loss of normal swimming behaviour and rapid tissue degeneration.

Coral reefs are among the richest and most diverse fishing grounds in the oceans. Coral fish are targeted for food, sport, and for live fish for restaurants and for aquarium fish. Cyanide fishing, which involves spraying or dumping cyanide onto reefs to stun and capture (live) fish, kills coral polyps and degrades the reef habitat. More than 40 countries are affected by cyanide fishing activities,

and it is now practised in countries from East Africa to the central Pacific. Exposure of corals to cyanide can result in a reduction or cessation of respiration, a reduction in phototrophic potential and a decrease in growth rates and fecundity. The most obvious response is bleaching. Re-establishment of the symbiosis may take from six months to one year or more.

The effect of copper on corals is of serious concern because there are numerous sources that expose corals to copper. Copper is a major component of antifouling paints, is found in sewer discharge, is a component of some fungicides and herbicides that are used on coastal agricultural crops, for wood preservation in waterworks, and in heat exchangers in power plants. Relatively low concentrations of copper can disrupt reproductive success in reef coral. Cu affected photosynthesis in zooxanthellae of A. cervicornis at 4 μgl^{-1}. Negri& Heyward (2001) found that at 17 μgl^{-1} copper fertilization success in Acroporamillepora was reduced to 50%, and Victor & Richmond (2005) found a 12h EC50 for impaired fertilization success of 11 μgl^{-1} in A. surcusola. The 12h EC50 value for motility of Goniastreaaspera larvae is 21 μgl^{-1}.Until the ban on the use of TBT in 2003, antifouling paints contained the compound as biocidal component, along with copper and zinc. As of today, high concentrations are still present in harbour and waterway sediment and around shipwrecks. The latter may represent important sources of toxic substances. A good example has been described by Smith et al. (2003), who found extensive contamination of reef sediments for up to 250 m surrounding the grounding site of an oil carrier. Branchlets from adult corals exposed to sediments with a high concentration of contaminants (TBT 160 mg kg^{-1}, Cu mg kg^{-1},180 mg kg^{-1}, and Zn 1,570 mg kg^{-1}) suffered significant mortality (38%), and Negri& Heyward (2001) showed that TBT inhibits fertilisation and larval metamorphosis in A. millepora with an IC50 of 2 $\mu g\, l^{-1}$.

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21. ELEMENTS AND ITS FUNCTIONS IN HUMAN BODY

ELEMENT	PERCENTAGE COMPOSITION IN BODY	FUNCTIONS
Oxygen	65.0%	Critical to the conversion of food in to energy.
Carbon	18.5%	Backbone of the building blocks of the body. Key part of testosteron and estrogen.
Hydrogen	9.5%	Helps to transport nutrients, remove wastes and regulate body temperature. Play an important role in energy production.
Nitrogen	3.3%	Found in aminoacids. Essential part of the nucleic acids that constitute DNA.
Calcium	1.5%	Important for the functioning of nerves and muscles, lends rigidity and strength to bones and teeths.
Phosphorus	1.0%	Needed for building and maintaining bones and teeths. Found in ATP which provides energy.
Potassium	0.4%	Important for electrical signaling in nerves and maintains the balance of water in the body.
Sulphur	0.3%	Found in cartilage, insulin, proteins that play a major role in the immune System and keratin.
Chlorine	0.2%	Needed by nerves to function properly. Helps to produce gastric juice.
Sodium	0.2%	Play a critical role in nerves electrical signaling. Regulate the amount of water in the body.
Magnesium	0.1%	Play a major role in the structure of the skeleton and muscles.
Iodine	Trace amount	Part of an essential hormone produced by the thyroid gland.
Iron	0.006%	Part of haemoglobin which carries oxygen.

22. NANOCHEMISTRY

Nanochemistry is the combination of chemistry and nanoscience. Nanochemistry is being used in chemical, physical, material science as well as engineering, biological and medical applications. Nanochemistry can make the most effective contrast agent of MRI out of iron oxide crust which has the abiliy of detecting cancers and even killing them at their initial stages. Nanochemical methods can be used to create carbon nanomaterials such as carbon nanotubes (CNT), graphene and fullerenes. Sunscreen contains nanoparticles of zinc oxide and TiO_2.It protects the skin against harmful UV light. Electrospinning is Polymerization method used biologically in tissue engineering, but can be functionalized for wound dressing and drug delivery.Nanoparticles of Ag are useful to inhibit some viruses and bacteria. Nanoenzymes (1-100 nm) have provided unique optical, magnetic, electronic and catalytic properties.Nano wires in nanosensor element increases the sensitivity in electrode response.

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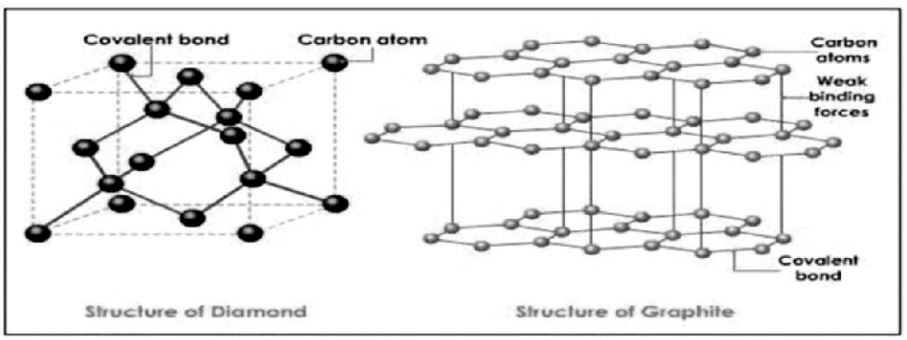
23. DIAMOND AND GRAPHITE

Diamond and graphite are examples of allotropes, where the same element forms two distinct crystalline forms. Diamond is one of the hardest known substances, prized for the transparent and highly reflective crystals that make it sparkle. In addition to making fine gemstones, diamond is also used industrially for cutting, grinding, sawing and drawing wire. Diamond and graphite are both non-metal made exclusively of carbon atoms. Graphite, on the other hand, is a soft, black substance used to make pencils. The hardness and density of diamond can be explained by its crystal structure. Each carbon atom is surrounded by four other carbon atoms in a regular tetrahedron. Each of these carbon atoms is then attached to three other carbon atoms, and that pattern continues to form a single, giant molecule held together by covalent bonds. Each carbon atom is surrounded by four other carbon atoms in a regular tetrahedron. Each if these carbon atoms is then attached to three other carbon atoms and that pattern continues to form a single, giant molecule held together by covalent bonds. In order to break the crystal, multiple bonds must be broken. Graphite forms in layers.



24. METAL ION CATALYSTS AND HYDROGEN PEROXIDE COULD GREEN UP PLASTIC PRODUCTION

The need to contribute to the development of more environmentally friendly catalysts for the production of plastics and resin precursors that are often derived from fossil fuels has led to a technique that comes from recognizing the unique physical and chemical properties of certain metals and how they react with hydrogen peroxide.

Many plastics are made from molecules called olefins that are derived from organic materials such as fossil fuels. To form these types of plastics, olefin molecule must be altered using oxidizing chemicals to make plastic and resin precursors, called monomers, by rearranging their chemical bond that can reach out and grab on to the other monomers. This allows them to stitch together long molecular chains the building blocks of plastics, said David Flaherty, a professor of chemical and biomedical engineering.

The current methods used for turning olefin molecules into something useful also uses or produces things we don't want, like chlorine which can be corrosive, and carbon dioxide. Many production processes use environmentally dangerous organic peroxide or chlorinated oxidants, these concerns have prompted the researchers to explore greener options for plastic manufacturing.

Today researchers have looked at how and why the identity of certain metals, called transition metals affects the reaction. They have also studied how efficient the process is when using hydrogen peroxide an environmentally friendly oxidant whose only waste product is water, not chorine or carbon dioxide. To form the critical monomers, olefins and oxidizers pass through tiny, rigid sponge like structures called zeolites. These zeolites contain metal ions in the pore spaces that act as catalysts to push the chemical reaction towards the plastic producing pathway. The reaction take two pathways; one that leads to the formation of monomers and one that leads to wasteful decomposition of hydrogen peroxide.

A class of biological materials found within numerous natural systems, most notably trees, cellulose nanocrystals have captured researchers' attention for their extreme strength, toughness, light weight, and elasticity. The materials are so strong and tough, in fact, that many people think they could replace Kevlar in ballistic vests and combat helmets for military. Unlike their source material (wood), cellulose nanocrystals are transparent, making them exciting candidates for protective eyewear, windows, or displays.

"Rather than just producing a material and then testing it to see what its properties are, we instead strategically tune design parameters in order to develop materials with a targeted property in mind," Sinko said. "When you are equalizing music, you can turn knobs to adjust the bass, treble, etc. to produce a desired sound. In materials-by-design, we similarly can 'turn the knobs' of specific parameters to adjust the resulting properties."

The world's hottest new super material isn't as fancy as you might think; in fact, it is produced by feeding wood pulp to algae. The result, nanocellulose, is amazingly light, super-strong, and conducts electricity. That versatility lends it to plenty of fantastic possible applications.

Nanocellulose is made from a tightly packed array of needle-like crystals, it is incredibly tough stuff. In fact, it has a strength-to-weight ratio that is eight times higher than stainless steel, which makes it perfect for building future body armor that is both strong and light.

Nanocellulose is transparent, light and strong, it can be used in place of plastic or glass. That is why Pioneer Electronics is experimenting with it to make some of the most insanely thin and flexible screens of the future.

A bit like graphene, the nanostructure of nanocellulose can be used to create fancy filters that can purify all kinds of liquids. That might mean making saltwater drinkable but it could also be used to filter out blood cells during transfusions, or even trap dangerous chemicals in cigarettes.

Swap the usually thick and stiff separators inside batteries for something made of thin, flexible nanocellulose, and all of a sudden you end up with a mobile power source that bends a little. Combine it with a graphene shell, and you might just have the flexible battery we've all been dreaming of.

Nanocellulose can be crafted into foam that can support more than 10,000 times its own weight. As a result, it is incredibly porous and super-absorbent. This stuff could make the fanciest wound-dressings and tampons you could ever possibly imagine.

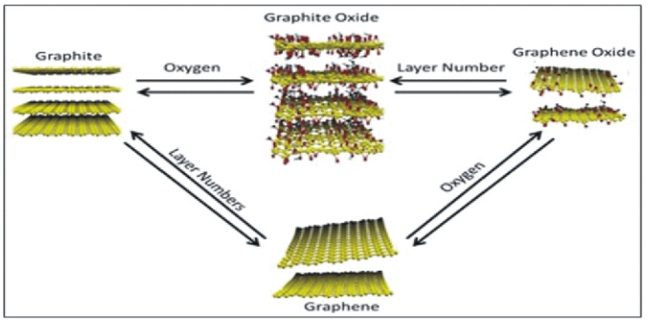
Nanocellulose is actually quite cheap it is made by algae, after all it should be possible to use it in serious bulk. In fact, Ford reckons it would be able to create so many components out of the stufffrom body panels to interior trim that it could shave 750lb off the weight of its cars.

In the process of having algae chomp through wood pulp to make nanocellulose, it is possible to rig the process by tweaking the DNA of the helpful little bugst ocreate biofuel at the same time. technically not a product of nanocellulose, but an amazingly useful byproduct of its production.

26. MATERIAL OF THE DECADE "GRAPHENE"

Carbon is a ubiquitous material that has been ever found whereas the epoch making material graphene is also allotropy of carbon. Graphene is a plane sheet of sp^2 hybridized carbon atoms tightly confined into a honeycomb lattice. In 2004, the first discovery of graphene using a scotch tape peeling method brought a dramatic revolution, especially in the world of materials science. Recently, this single sheet of carbon has attracted huge interest among the scientific community owing to the two dimensional structure. It is proved that an ideal graphene sheet is highly ordered and shows several extraordinary behaviors including outstanding surface areas (2630 $m^2 g^{-1}$), high Young's modulus (1.0 TPa), high thermal conductivity (~5000 W $m^{-1} K^{-1}$) and strong chemical durability and high electron mobility (2.5 x 10^5 $cm^2 V^{-1} s^{-1}$). It also exhibits single-molecule gas detection sensitivity, quantum confinement in nano scale ribbon, long range ballistic transport at room temperature and high optical transmittance (~97.7%). These unique characteristics of graphene opened a new way for its wide range of application at different branches of technology such as: lithium-ion batteries, catalyst chemically derived sensor, biosensor, anti-bacterial activities, flexible thin film transistor, drug delivery, solar cells, photovoltaic devices, intracellular imaging, pn junction materials, super capacitor, touch panel, water purification, absorption of different non aqueous liquid e.g., oils, alkenes, aromatic compounds, dyes, organic solvents, and ionic solutions.

Graphene oxides (GO) are another important member in the graphene-graphite family, which are considered as derivatives of graphene. It is different from graphene, which is almost not soluble and cannot be dispersed in water or any organic solvent, graphene oxide contains high-density oxygen functional groups, like hydroxyl and epoxy group on its basal plane, and carboxyl at its edge. They afford graphene oxide with excellent water solubility, ease of functionalization and convenience in processing etc., making it the most popular precursor of graphene. Graphene oxide reduction is considered a promising approach for the mass production of graphene. The product obtained by this method is commonly termed as reduced graphene oxide (RGO) or graphene nano sheet (GNS). However, graphene oxide acts as a precursor to synthesis ereduced graphene oxide or graphene nano sheet. It is produced from graphite flakes by oxidative reaction, which heavily decorates the sheets with different oxygen moieties.



27. BIOMATERIALS IN WOUND HEALING APLICATION

A wound is a reversible or irreversible outcome of injury in which the part affected is torn, cut or punctured. This may be due to trauma, surgery or health disorders. Wound healing is the gradual renovation of bruised tissues. An ideal wound dressing is capable of: (a) promotes a moist wound environment (b) provides mechanical protection (c) allows for nonadherence to the wound (d) ensures protection from heat (e) capable of absorbing excess exudates (f) allows for gaseous exchange and (g) non-cytotoxic to healthy tissue. Traditional wound care products such as bandage rolls and pads, gauze dressings, medicated gauzes, nonadherent dressings, medical tapes and adhesive bandages, wound cleansing products, wound irrigation solutions, wound closures do not provide these qualities sufficiently. Conversely a lot of advanced wound care products such as foam dressings, hydrogels, hydrocolloids, transparent film dressings, and antimicrobial dressing heal the wound quickly and without pain by maintaining adequate dampness and a shield around the wound. However, many of these modern wound dressings possess some disadvantages, such as inadequate swelling to absorb excess wound sufficiently. Conversely, a lot of advanced wound care products such as foam dressings, hydrogels, hydrocolloids, transparent film dressings, and antimicrobial dressing heal the wound quickly and without pain by maintaining adequate dampness and a shield around the wound. However, many of these modern wound dressings possess some disadvantages, such as inadequate swelling to absorb excess wound exudations, insufficient strength to overcome stress caused by skin movement, and deficient flexibility; therefore, the exploration of an ideal wound dressing is still ongoing.

Researchers are developing wound dressing materials using biomaterials like collagen, chitosan, fibrin, gelatin, etc.,

FIBRIN is the first scaffold that the skin encounters after an injury. Fibrin gels formed from purified plasma proteins have properties similar to a blood clot and it is biodegradable. Since fibrin can bind to numerous proteins, similar to a blood clot, it can be used as haemostatic glue to stop bleeding, replace sutures and also in wound healing.

COLLAGEN the most abundant animal protein plays a vital role in pre and postoperative surgical procedure. It can form fibers of great tensile strength and stability via cross linking and self aggregation. Collagen from various sources (porcine, rat, leather wastes) areused aswound dressing material, which is Biodegradable, biocompatible, non toxic, thermally stable and used to cover burn wounds and treat ulcers. Collagen supports the growth of supporting new tissue by adhering to the walls of the wound and absorbing the wound fluids.

GELATIN is biodegradable, biocompatible, has excellent physical, chemical and mechanical properties and commercially available at low cost. Possesses good elongation and deformation properties which provide easier opening of spaces for cell penetration to a deeper level of scaffold. Hence it can be used as a biodegradable scaffold and as an efficient substitute in case of skin loss.

ALGINATE a naturally occurring anionic and hydrophilic polysaccharide possesses excellent biocompatibility, biodegradability, mechanical strength, cell affinity, gelling properties, non-antigenicity, chelating ability. Readily processable in the form of hydrogels, microspheres, sponges, foams and fibers which can be used as wound dressing materials. Enhance wound healing by stimulating monocytes to produce elevated levels of cytokines. Possess high levels of bioactivity due to endotoxins and used to treat large volume exudation.

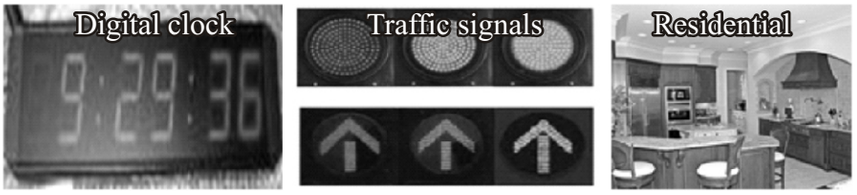
CHITOSAN a natural polymer derived from chitin.(major source : crab shell) is biodegradable, biocompatible, antibacterial and non toxic linear chain of polysaccharides. Hydrophilic and haemostatic in nature and hence, used as a hydrogel for wound healing applications. Pure chitosan hydrogel is fragile but when used in combination with other biomaterials or compounds for an improved strength.

A study on these biomaterials proves that the biomaterials had benefits of properties like biocompatibility, antimicrobial activity, water swellable nature, good healing efficiency and tensile strength.

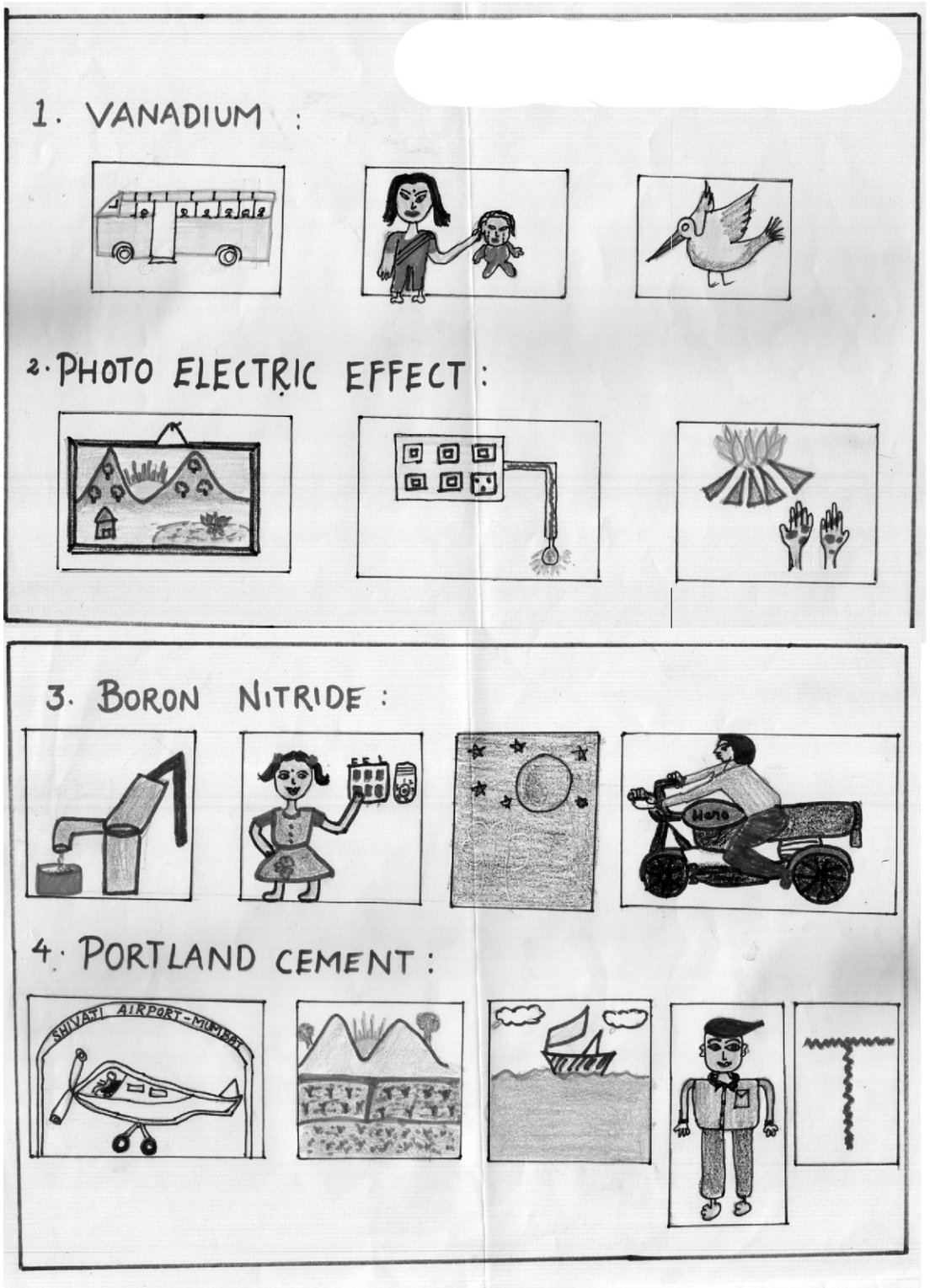
28. LUMINESCENT PHOSPHORS AND ITS APPLICATION IN DIFFERENT FIELDS

Energy is an essential commodity in our lives, and the use of energy is increasing with industrial development. Lighting plays a vital role in our everyday lives as well as in commerce and industry worldwide, and it consumes considerable amount of the total energy produced. Energy efficiency is one of the most effective means to meet the requirements. Considering the growing demand for high efficiency lighting devices, various scientists all over the world are working to meet this challenge. For the near future, Solid State Lighting (SSL) is emerging as a promising lighting technology replacing conventional lighting sources like incandescent, fluorescent and high pressure discharge lamps. Coupled with the energy savings, environmental safety and aesthetic quality are dealt in the solid state lighting technology. Solid state lighting based on white Light Emitting Diodes (LEDs) could save electricity and reduce environmental problems.

There is a strong increase in the use of phosphor converter LEDs (PCLED) for white light illumination applications. Presently, the most popular method is to use a blue LED (~ 450 nm band emission) and a yellow emitting phosphor, such as Cerium doped yttrium aluminum garnet (YAG:Ce). Here, the blue light activates the phosphor, two colors mix to perceive white. These LEDs had lifetime -100,000 h and luminescence efficiency more than 50 lm/W.



29. CONNECTIONS



30. SKETCH OF FAMOUS SCIENTISTS