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Editorial

Chemistry has become one of the top applied sciences among other sciences and its role in the modern science arena is very crucial. Although it is taught as a subject through our primary, secondary and higher education, the application of Chemistry in our day today matters is not appreciable. Chemistry has a high potential in solving most of the problems we face today. Some of our economical, health, environmental and social problems have either a direct or indirect relation with Chemistry. This is the way to strengthen the local research innovation, instead of promoting foreign innovations and applications. A generation that investigates the pathway of community progress in line with its physical, social and cultural factors is what the society demands today. This will be the great honour that the free education of our country gains.

Being a fertile soil for number of creditable scientists, researches and students Department of Chemistry at University of Sri Jayewardenepura is slowly but steadily paving the way for the new generation of chemists who are aimed with ample knowledge in Chemistry to face the 'twist and turns' in the ever changing environment of science.

Hence, it is with the greatest pride that we present to you the tenth issue of this annual science magazine "Crucible", as one of the many contributions from University of Sri Jayewardenepura, with the hope of disseminating scientific information in Sri Lanka.

On behalf of the chemical society, I thank all who extended their support to make the publication of this year's "Crucible" a reality.

K.A.K.D.Wijesekera

The Editor

MESSAGE FROM THE DEAN,

FACULTY OF APPLIED SCIENCES

I am extremely happy to send this message of felicitation of the Chemical Society of Sri Jayewardenepura at a time when the members of the executive committee are making every effort to bring about the tenth edition of the journal "CRUSIBLE".

A journal of any discipline is considered be a modus operandi for the dissemination of knowledge of that discipline. In the last year journal we witnessed several scientific writings from our students in the Department of Chemistry. The publication of a journal of this nature will train them among other things how to present their ideas in a manner understandable to readers. This is an integral part of the study in every discipline. In this context, scientific writing, presentation & edition play an important role. This also forms a part of their study of the discipline. I am personally aware of the motivation & enthusiasm of our students in collective work of this nature.

I am also take this opportunity to thank the Head and members of the academic staff especially the senior Treasurer for giving the necessary guidance & encouragement to the executive committee of the Chemical Society to make this venture a success.

I wish every success to all activities of the chemical society.

Prof. S.S.L.W. Liyanage

B.Sc. (USJ), Ph.D (Cardiff, Wales), M.I. Chem.C., MRSC

The Dean

Faculty of Applied Sciences

University of Sri Jayewardenepura

MESSAGE FROM THE HEAD, DEPARTMENT OF CHEMISTRY

It is my pleasure to issue this message to the 10th Edition of the 'Crucible', the annual publication of the Chemical Society of the University of Sri Jayewardenepura.

The 'Crucible' has come a long way since it was first published 10 years ago. With the advancement of the Chemical sciences and widening of horizons facilitated by information technology, the Chemical Society should make every effort to maintain a high standard of its publication.

The Chemical Society has shown much commitment and dedication during the past year, in its efforts to disseminate knowledge in chemistry, by organizing many guest lectures. Through its activities, the Chemical Society has also provided a forum for its members to participate in competitions thereby developing leadership skills and creativity, and other soft skills.

With the increasing number of students offering Chemistry, both in the General degree and Special degree programmes, the Chemical Society has the potential to be the best student society in the faculty and every member of the Society should work towards making it a reality.

My congratulations to the President of the Chemical Society and his team, for their untiring efforts taken to publish this magazine and maintaining its high standard.

Professor Siromi I. Samarasinghe

BSc (Vidyodaya), MSc., PhD.,(Leeds) C.Chem F.I Chem C

Head/ Department of Chemistry

University of Sri Jayewardenepura

DEPARTMENT OF CHEMISTRY

Academic staff and their research interests

Prof. Siromi I. Samarasinghe (Head, Department of Chemistry)

B.Sc. (USJ), M.Sc. (Leeds), Ph.D (Leeds), F.I.Chem.C.

Research Interest:

Physico chemical properties of yam starches, Polyphenols in foods and beverages, Flavour compounds in black tea, antioxidant activitv of tea flavanoids.

Prof. S.S.L.W. Liyanage

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Research Interest:

Synthesis of tri-phospharmacrocycles, Improvement of quality of natural rubber latex, Detailed study on degradation pattern of polymer based products.

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Research Interest:

Synthetic and physical organic chemistry, Bioactive Natural Products, Herbal Drugs.

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B.Sc. (Colombo), Ph.D (Dalhousie), F.I. Chem.C

Research Interest:

Determination of trace metals and non-metals in food and water, Mechanism of oxidation of organic molecules by metal ions/complexes.

DEPARTMENT OF CHEMISTRY

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B.Sc. (USJ), Ph.D (Belfast), M.I. Chem.C.

Research Interest:

Reaction kinetics, Corrosion and Electrochemistry/ Dye sensitized nano-porus photovoltaic devices/ Molecular mechanics, dynamics and emi-empirical computational calculations/ Photochemistry and photophysics of labile metal complexes, Raman, Surface Enhanced Raman and Excited State studies of complexes and Spectroscopic studies of metal colloids, Sols and MELLFs.

Prof. W.D.W.Jayatilleka

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Research Interest:

Chemical education, Semiconductor Photocatalysis, Water Chemistry and Technology.

Dr.K.C.P.Mahatantila

B.Sc. (USJ), Ph.D. (Ottawa), F.I.Chem.C.

Research Interest:

Natural Products Chemistry

Dr. Champa D. Jayaweera

B.Sc. (USJ), Ph.D (Belfast), M.I. Chem.C.

Research Interest:

Trace metal analysis, Applications of chemical kinetics in Analytical Chemistry, Flow Injection Analysis, Determination of tetracycline residues in broiler meat.

DEPARTMENT OF CHEMISTRY

Dr. L.Karunanayake

B.Sc. (USJ), Ph.D (North London)

Research Interest:

Use of Vegitable oils and their derivatives as an additive in the polymer industry, Use of locally available tannin materials to make polymer resin.

Dr. Asiri Perera

B.Sc. (Colombo), MSc, Ph.D (Wichita state University)

Research Interest:

Comparison of migration behavior of contaminants from plastic bottles to food, Clearage of Bisnitrophenylphosphate using peptides.

Dr. L.M.K. Tillekeratne

B.Sc. (Colombo), Ph.D (University of Aston Birmingham, UK)

Research Interest:

Processing and testing of Natural Rubber, Technical properties of synthetic and Natural Rubber, Environmental aspects of SR and NR carbon sequestration and effluent treatment, Chemical modification of chemicals used in the rubber industry.

Dr. M.N.S. Kottegoda

Ph.D (University of Cambridge, UK)

Research Interest:

Material chemistry and Nanochemistry.

DEPARTMENT OF CHEMISTRY

Dr. S.D.M. Chinthaka

B.Sc. (USJ), Ph.D (Wayne State University, USA)

Research Interest:

Metal ion additives of commonly used MALDI matrices determined by Guided ion beam tandem mass spectrometry, implication for MALDI mass analyses, Determination of trace levels of organic pollutant in environment by solid phase micro extraction (SPME) coupled with GC and GC-MS, Dispersive liquid-liquid extraction (DLLM) of organic pollutant in surface water./Pre-concentration and analysis of organic and inorganic pollutants by cloud point extraction(CPE)coupled with AAS, GC and GC-MS.

Dr. Theshini Perera

B.Sc. (Colombo), Ph.D (Louisiana State University, USA)

Research Interest:

Synthesis of inorganic complexes (Re,Pt,Ru) of biomedical relavence, Applications of 1D and 2D NMR and other spectroscopic methods to characterize structure and properties of metal complexes.

Dr. Chayanika Padumadasa

B.Sc. (Colombo), Ph.D (University of Oxford, UK)

Research Interest:

Natural Products Chemistry, Synthetic Organic Chemistry

Dr. S.D. Atula Sandanayaka

B.Sc. (USJ), Ph.D (Tahoku University, Japan)

Research Interest:

Nanoscience and technology, Photoinduced electron transfer reactions

ARSENIC IN CHICKEN AND CHICKEN LITTER

Researchers from the National Institutes of Health and the USDA's Food Safety Inspection Service recently reported alarmingly high levels of arsenic contamination in the flesh of broiler chickens. After having reviewed about 5200 chicken samples from the US, these government researchers found that the mean concentration of arsenic in young chicken was 0.39 ppm, 3- to 4-fold higher than in other poultry and meat. Based on the fact that chicken is a meat source of growing importance, it is reasonable to assume that arsenic ingested through chicken consumption has a significant influence on the arsenic intake by humans.

Whether these findings are a real threat for human health very much depends on the arsenic species present in the meat. The US poultry industry and the pharma industry argue that the organic form of arsenic given to chickens isn't toxic. Indeed, phenylarsonic organic arsenicals are less toxic than inorganic compounds or aliphatic and other aromatic organic compounds.

However, based on the somewhat outdated and at that time preliminary results obtained by Levine and Weiler, stating that about 65% of arsenic in poultry meat is inorganic, the researchers found that consumption of chicken meat could alone be responsible for 25% of the tolerable daily intake of 2 µg/kg/day of inorganic arsenic (WHO 1983).To make the picture a bit more complicated, there is some indication that cooking the meat may create additional toxic arsenic by-products.

Anyhow, how did the arsenic get into the chickens? Since the 1970s, the poultry industry has used certain arsenic-based ingredients as chicken feed additives. The three major compounds in this class are arsinilic acid, roxarsone (4-hydroxy-3-nitrophenylarsonic acid), and nitarsone (4-nitro-phenylarsonic acid). Roxarsone is currently the most commonly used arsenical compound in poultry feed in the United States, with a usage of 23 to 45 grams of chemical per ton of feed for broiler chickens for increased weight gain, feed efficiency, improved pigmentation, and prevention of parasites. Roxarsone is used in turkeys as well as chickens. There is a high potential to these arsenical use in Sri Lankan poultry industry.
Some researchers have started to scrutinize the long-standing practice because of possible health and environmental risks. Questions about potential risks associated with the use of roxarsone center on the practice of spreading manure.
Each broiler excretes about 150 milligrams (mg) of roxarsone in the 42-day growth period for administering roxarsone. Litter collected following this period contains from 15 to 50 milligrams per kilogram (mg/kg) of total arsenic. In poultry houses where million of broilers per year are raised, a volume not uncommon for major poultry-producing areas, litter that contains much more arsenic would be produced. Generally, the litter is used as nitrogen-containing fertilizer in nearby fields. Litter is routinely tilled into cornfields or applied to pastureland. If a 100-hectare field was fertilized at 2 metric tons per hectare, about 10 kg of arsenic would be introduced to the environment.

Even if the relative amount of arsenic being added to soil by chicken manure might be a small percentage of the total arsenic in the soil, it has a higher mobility in water due to the sorption characteristic of arsenic in organic matter compared to arsenic sequestered by metal oxides. The high extractability of roxarsone from poultry litter suggests that roxarsone can easily be mobilized to the environment by either agricultural field irrigation or rainfall on uncovered windrows. Degradation could be possible through biotic and abiotic processes after roxarsone is mobilized. Inevitably, arsenic finds its way into the rivers, stream and even the crops that are later consumed by humans. Via the way of waste incinerators, it also may find its way to the atmosphere.

There are also some rumors, that poultry industry, like the beef industry, is steeped in evil practices. By feeding chicken litter to cattle, cows are ingesting highly toxic arsenic that's contained in the chicken litter.

Inorganic arsenic is considered one of the prominent environmental causes of cancer mortality in the world. Arsenic is a human carcinogen linked to liver, lung, skin, kidney, bladder and prostate cancers. It can also cause neurological, cardiovascular, gastrointestinal and immune system abnormalities. Diabetes has also been linked to arsenic exposure .

In view of this toxicity and the fact that organic arsenic can be transformed to more toxic species, the practice of feeding chickens even trace amounts of arsenic seems bizarre.

J.G.P.S Ubesena.
President
Chemical society

CHEMISTRY IN THE SERVICE OF MANKIND

Chemistry is defined as the science of atoms and molecules as it deals with the composition, structure and properties of matter which can be best described and understood in terms of these basic constituents of matter. Chemistry is the science not of the only about one hundred elements but of the infinite variety of molecules and related species that may be built from them. Our body is made up of tissues, which are all composed of chemicals. We need an adequate supply of chemicals in the form of food, vitamins, hormones, and enzymes, which are all chemicals. For taking care of our health we need medicines. We find that chemicals and chemistry penetrate into every aspect of our lives as essential items of our daily needs such as: Paper, sugar, starch, vegetable oils, ghee, essential oils, tannery, distillery, soap, cosmetics, rubber, dyes, plastics, petroleum etc are all the valuable gifts of chemistry. The materials with which one comes into contact in everyday life are polymers, rubber, plastics, textiles and many of the constituents of living things, such as cellulose and proteins. In fact there is almost nothing that we use in our daily life and it is not a chemical.

The service of chemistry of medicine represents as one of the most fascinating facts of the story of the application of scientific knowledge to the welfare of mankind. These are substances which provide the necessary elements like Nitrogen, Phosphorus Potassium, and Calcium etc. to humans and plants. While we are well posted with the hard fact that Arsenic and many of its compounds are deadly toxic, it is worth mentioning that Arsenic has also been used as a life saver. In the nineteenth century, physicians had no means of combating infection and patients usually had no fate but to die. In 1863, when French scientists, Bechamps, noticed that an arsenic compound was toxic to some micro-organisms whose report encouraged Paul Erhlich, a German scientist, to synthesize new arsenic compounds, testing each one for its organism killing ability, finally came up with a substance in 1909, which selectively killed the syphilis microorganism. At the time, syphilis was a feared and wide spread disease for which there was no cure. In 1935, Gerhard Domagk, administered a dose of a dye called prontosil (that inhibits the growth of streptococci bacteria) to cure his daughter's fever. This field, now known as Chemotherapy has produced one of the most effective tools of controlling bacterial infections and those of many other micro-organisms. Chemotherapy also provides one of the lines of attack against cancerous tissues. And it all started with an arsenic compound. It has been established that Tension and Mental stress escalate the level of acid in bile juice causing hyperacidity that can be combated using antacids mostly bases like calcium carbonate, magnesium hydroxide or aluminium hydroxide in the form of tablets or aqueous suspensions. These react with hydrochloric acid in the stomach and neutralize it partially and bring relief to the sufferers from consequences of hyperacidity. Histamine is naturally present in almost all body tissues and is released when the human body meets substances that cause allergies. For example, when a person is suffering from hay fever, histamine is released.

We know that colored substances used for dyeing fabrics are called dyes. A true dye must have a suitable color; be able to attach itself to the material from solution or be capable of being fixed on it, and be fast to light and washing when fixed. For this it must be resistant to water, acid and alkali. Chromophores are unsaturated groups or groups with multiple bonds that impart color to the organic compounds. Examples are the nitro, the nitroso and the azo groups. Methyl orange, an azodye, is prepared by coupling diazotized sulphanilic acid with dimethylaniline. Aniline Yellow is another azodye but has little value as a dye because of its sensitivity to acids. This is the simplest basic azo dye and can be obtained by coupling benzene diazomium chloride with aniline.

It needs no mention that there are many chemicals which find great use in cosmetics too. Creams like cleansing creams, cold creams, bleaching and vanishing creams are prepared synthetically from chemicals. Perfumes, talcum powders and deodorants are also some other cosmetic substances that are obtained from chemicals. Lipsticks, nail polish and hair dyes also are chemical substances. Perfumes have pleasant smell due to the esters used in their synthesis.

Besides being useful, chemicals find use in artifacts as well. Ceramics, paints, varnishes, glass, cement and likes are various other useful substances that contain various chemicals as their main components. Construction industry is the major beneficiary of such substances.

It may not be exaggeration to say that whereas we are used to talk of chemicals in food, in actuality, natural food substances are various forms of chemicals. For example, rice is a carbohydrate. Fruits contain carbohydrates and organic acids like citric, benzoic, maleic, and ascorbic acids. Vegetables contain proteins (amino acid blocks) and vitamins. Besides these, chemicals are used as preservatives too for canned or bottled food items. Chemicals also find use as edible colors and

artificial sweetening agents. Since sugar cannot be used as a sweetening agent for diabetic patients, artificial sweetening agents that are non-nutritive in nature are used as substituents for sugar (especially in soft drinks). Examples are saccharin which is 500 times sweeter than sucrose, and cyclamates. Food colors are used in ice creams, dairy products, sweet meat, soft drinks, confectionery, etc. These colors are also used in oral medicines like capsules, tablets, syrups and liquids to improve their appearance. Some of the primary colors are water soluble.

A common problem of the daily routine in homes and laboratory is that of removal of unwanted materials like oils, grease dirt, etc. from the surface of clothes, utensils, apparatus, machines and our skin. Soaps and detergents are best chemical used for this purpose. Soaps are sodium or potassium salts of higher fatty acids like stearic, palmitic and oleic acids. The sodium soaps are called hard soaps and the potassium soaps are known as soft soaps. Synthetic detergents are sodium salts of long chain benzene sulphonic acids or sodium salt of long chain alkyl hydrogen sulphates.

These are a very few examples where Chemistry is involved in day to day life of man. Can you ever finish seeking the application of Chemistry in the service of mankind?

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R.H.A.C.U. Ranasinghe

Chemistry Special Part II

CHEMISTRY BEHIND THE HAIR COLOURING

Most of the ladies and men in all over the world use cosmetics like creams, nail polish, eye shadows, lip liners, hair gel , lipstick and powders etc. These all are synthetic chemical compounds even though they were trade as 100% natural cosmetics. Except these cosmetics people use several methods to increase their beauty like air straightening, hair colouring and etc. There is interesting chemistry behind the hair colouring.

There is a natural colour in our hair. These colours have given by melanin proteins. There are two types of melanin protein found in the hair: eumelanin, which is responsible for hair shades from black to brown, and phaeomelanin, which is responsible for red and yellowish colours. Absence of pigment produces white or gray hair. The melanin type and granule size determine the colour of hair, while the density of distribution of these pigment granules determines how light or dark the hair is.

There are several types of hair colourings. In those methods several chemicals have been used.

Temporary hair colour Temporary hair colour is available in various forms including rinses, shampoos, gels, sprays, and foams. Temporary hair colour is typically brighter and more vibrant than semi-permanent and permanent hair colour. The pigment molecules in temporary hair colour are large and cannot penetrate the cuticle layer. The colour particles remain adsorbed (closely adherent) to the hair shaft and are easily removed with a single shampooing. Temporary hair colour can persist on hair that is excessively dry or damaged in a way that allows for migration of the pigment to the interior of the hair shaft. It lasts for about a few hours to 1 day.

Semi-permanent hair colour Semi-permanent hair dye has smaller molecules than temporary dyes, and is therefore able to partially penetrate the hair shaft. For this reason, the colour will survive repeated washing, typically 4-5 shampoos or a few weeks. Semi-permanents contain no, or very low levels of developer, peroxide or ammonia, and are therefore safer for damaged or fragile hair. However, semi-permanents may still contain the toxic compound P-Phenylenediamine or other such ingredients. The final colour of each strand of hair will depend on its original colour and porosity, so there will be subtle variations in shade across the whole head. However, it also means that gray or white hairs will not dye to the same shade as the rest of the hair.

Permanent Hair Colour Before any permanent colour can penetrate the hair shaft, the cuticle, or outer layer, must be opened so that chemicals can get in to the natural pigment molecules. Under a microscope, the cuticle of human hair looks a lot like overlapping snake scales. The pigments, which are protein granules, are stored in the cortex of the hair beneath the scaly cuticle layer.Permanent hair colouring products consist of two components that are packaged separately and mixed together immediately before application. One package contains a solution of hydrogen peroxide (usually 6%) in water or a lotion base. The other package usually contains an ammonia solution of dye intermediates and preformed dyes called couplers. The primary intermediates are ortho or para diaminobenzenes, aminohydroxybenzenes, and to a lesser extent dihydroxybenzenes that develop colour on oxidation. The colour couplers don't oxidize readily but react with the oxidized primary intermediates to provide a wider variety of colours. The couplers are phenols, meta disubstituted phenylenediamines and phenyleneaminophenols, and various resorcinol (1,3-dihydroxybenzene) derivatives.

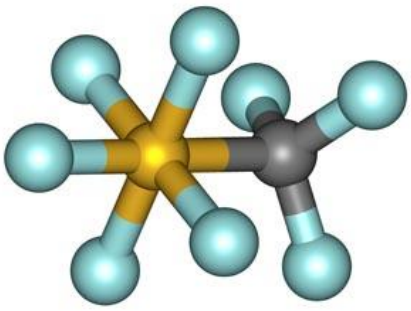
As soon as the ammonia dye solution and the hydrogen peroxide solution are mixed together, they are applied to the hair. The ammonia in the mixture (less than 1% concentration) causes the hair to swell and the cuticle scales to separate a little. After this happens, the dye precursors are able to penetrate the cuticle before they have fully reacted with each other and with the hydrogen peroxide. This is why even when brown hair colouring is first applied it looks whitish. This is also why you have to wait a half hour or more for the colour to develop.

Darker shades are obtained by using higher concentrations of intermediates. Tones can also be adjusted. For example, addition of resorcinol will make a shade more yellow, while adding 4-amino-2-hydroxytoluene will make the shade redder. Sometimes dyes are used along with the oxidation dye intermediates to add vibrancy to the tone that is not otherwise available. Usually these dyes are used to add intensity to gold or red shades.

P.L.P Tissera
Chemistry Special Part II
Source;Chemical & Engineering News
American Chemical Society

CF_3SF_5 – A 'SUPER' GREEN HOUSE GAS

Trifluoromethyl sulfur pentafluoride - a byproduct of the electronics industry - has been named a 'super' greenhouse gas by physical chemists. But what evidence do they have that makes this molecule a potential threat to the environment?



Trifluoromethyl sulfur pentafluoride

CF_3SF_5 is a gas at room temperature with a boiling point of 253 K and an enthalpy of vaporisation of 20 kJ mol-1. The gas was first detected in the Earth's atmosphere in 2000,1 by which time the related SF_6 molecule had already been identified as a potential greenhouse gas.2 The source of CF_3SF_5 is believed to be anthropogenic, and most likely a breakdown product of the dielectric molecule SF6 in high-voltage equipment. The trends in concentration levels of SF_6 and CF_3SF_5 have tracked each other closely over the past 30-40 years , suggesting that CF_3SF_5 is probably produced in the electronics industry via the recombination of CF_3 and SF_5 free radicals.

Although most attention has been given to CO_2 (and possibly CH_4 and H_2O), physical scientists now understand that there are larger polyatomic gases of low concentrations in the atmosphere which can contribute significantly to global warming. These gases, which include SF6 and CF_3SF_5 ,1,2 absorb infrared radiation strongly in regions where CO_2, CH_4 and H_2O do not absorb.

Currently, there are no known undesirable chemical effects of low concentrations of CF_3SF_5 (and SF_6) in the atmosphere. However, their rapidly increasing concentrations and their exceptionally long lifetimes means that life on Earth may not be able to adapt to any changes these gases may cause in the future.

B. Thilini Fernando

Chemistry SpecialPart II

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PHARMACEUTICALS

Pharmaceuticals are chemicals that are prepared & sold with the intension of treating diseases. You might be happy to call such chemicals by the shorter name: drugs. However, we tend to think of a drug as a substance that is not used to treat illness but, like heroin, is taken illegally by people simply for the short-term pleasure effects it can give. Some pharmaceuticals are well known, particularly aspirin & paracetamol. Others are less common, but of extreme importance. Examples are listed in table 01. Recently there has been increasing evidence not only that aspirin will suppress headaches & minor pains, but that its regular use helps to protect the user against heart disease.

The pharmaceutical industry is one of the most important parts of the chemical industry. The market for pharmaceuticals has increased until it is worth billions of pounds each year. Millions of people benefit from the treatment they receive for illness that even 10 years ago would have been impossible to treat. We often take it for granted that an operation in hospital, or a visit to the dentist, can be almost painless. In fact the advances made in the design of pharmaceuticals have been so successful that we tend to think that almost every complaint will be able to be treated. Nature is not so easily overcome! For example, when it was first widely used against bacterial infection during the Second World War, penicillin was almost 100% effective. Now a wide range of bacteria have adapted so that they are resistant to it. As a consequence, there is always a need for the pharmaceutical industry to adapt & design new, more powerful, anti-bacterial products.

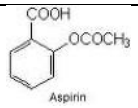
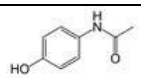
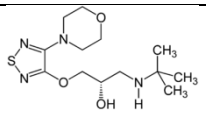
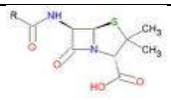
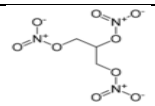
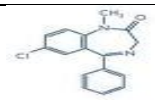
Many pharmaceuticals act directly on the brain. Valium does this. It is widely prescribed for people who are over-anxious or depressed. Valium is not in itself addictive, but its long-term use makes people dependent on it. Some people have criticized doctors for prescribing valium, because it does little to change the reason why the patient is over-anxious. However, doctors may say that they are not able to treat the main cause, which might be due to emotional strains, ex: divorce or living in an over-crowded flat.

The opiates are drugs that cause addiction. Heroin & cocaine are among the most famous examples. The chemistry of the brain adapts to the presence of the opiate in such a way that the person taking the drug feels an uncontrollable need to take more of it. Owing to their ability to induce an artificial feeling of well-being, the person taking heroin or cocaine quickly become addicted to them. Once this happens, the craving for the drug often causes the person to:

a) Neglect their nutritional needs;
b) Neglect ordinary rules of hygiene;
c) Enter into a life of crime in order to obtain the cash necessary to buy the drug

As a result a drug addict often becomes thin & susceptible to illness. Especially, those injecting drugs are highly likely to become infected by AIDS. Unfortunately, women heroin addicts often become pregnant & their babies are born already showing the signs of addiction. For society at large, addiction to heroin & cocaine poses two linked problems; one of law & order, another of public health. The wise person avoids any contact with illegal drugs, or those using them.

Table 01: Some important pharmaceuticals.

Name	Structure	Treatment of
Aspirin		Mild pain & heart disease
Paracetamol		Mild pain
Timolol		Glaucoma, an eye disease causing blindness
Morphine		Analgesic-masking of severe pain
Penicillin		Bacterial infections
Nitroglycerin		Angina, a common heart condition
Valium		Feelings of anxiety or depression

K.A.K.M.Kuruppu

Special Degree part II

FARNESOL

(To the tune of " Jingle Bells")

Take an acetate,
Condense it with a mate,
Pretty soon you have
Acetoacetate.
Let' em have a ball,
You get Geraniol.
Add another isoprene
And you get farnesol.
Farnesol , Farnesol, good old Farnesol,
First it goes to squalene, then you get cholesterol.
Farnesol , Farnesol, good old Farnesol,
First it goes to squalene, then you get cholesterol.
Now squalene makes a roll,
Becomes lanosterol.
The extra methyls do
Come off as CO_2
Then comes zymosterol,
Add then desmosterol,
If you don't take Triparanol,
You get cholesterol.
Farnesol , Farnesol, good old Farnesol,
First it goes to squalene, then you get cholesterol.
Farnesol , Farnesol, good old Farnesol,
First it goes to squalene, then you get cholesterol.

Kanchana Wijesekera
Editor-The Crusible
Source : Morrison & Boyd, Organic Chemistry 6th Edition

WHICH BRAND OF TOILET PAPER IS THE BEST ?

Introduction

The best toilet paper will be the one that has a highest absorbency. It should also be strong, but not too strong so that it can disintegrate easily and won't cause any unnecessary plumbing issues. To find out the best toilet paper in Sri Lanka, we have carried out market sample analysis in collaboration with Hemas innovation centre .Here we have used four different brands of toilet papers & conducted the Following test described in the material & method part.For which we directly used standard methods present in SLS798:2008 & for some characters we developed methods of our own modifying the existing methods.

Materials & Methods

a) Determination of Rate of absorption of water

Apparatus-Stop watch (Capable of measuring the time in second), Syringe with a needle (3ml), Lamp, Rubber band

Test specimens-Only one sheet shell to be used

Procedure-Place a test specimen on the rim of a beaker having diameter of about 50mm.Use a rubber band to firmly hold the specimen like a drumhead around the cup. Fill the syringe with distilled water at 27±2°C such that no air bubbles are trapped in the syringe. Allow a drop of water (0.0167g) to low on the specimen, holding the syringe at an angle of about 30°. Try to ensure the drops are the same size. Measure, with stop watch, the time taken for complete absorption of the drop of water as indicated by no further dispersion of the drop of water on the specimen.

b) Determination of total absorption

Apparatus-Balance (Capable of 1mg sensitivity), Holder, Syringe with a needle (50ml), watch glass

Test specimens - Only one sheet shell was used

Procedure-From each packet or roll take a random sheet & determination the mass of a specimen at room temperature. Hang it using a holder. Spray the water

using the syringe until it has become completely saturated with water & allow it to drip any excess water back into the puddle. Place the specimen in a tared weighing watch glass, & take its mass. Test each specimen in this way & from the results calculated & records the average total absorption as percentage.

c) Determination of p^H value(Appendix D of SLS 798:2008)

Apparatus-p^H meter (equipped with a glass electrode capable of measuring p^H value to an accuracy of 0.1), Suitable buffer solution (p^H - 4.01, 7.00, 10.01)

Test specimens-Sufficient pieces of specimen having an area of about 100mm^2 cut randomly from the specimen to provide specimens of approximately 0.15-0.20g shall be used.

Procedure-Place a specimen in a 250ml round bottom flask .Add 20ml of freshly boiled distilled water. Shake the flask until the pieces constituting the specimen are properly wetted. Add a further 50ml of water & fix a reflux condenser to the flask. Boil gently the contents of the flask for an hour. Allow the flask cool to room temperature & measuring the p^H value. Repeat the test with the second specimen & record the average pH value to the nearest 0.1

d) Determination of Ease of separation of Sheets(Appendix E of SLS 798:2008)

Procedure-Select a position at random on the toilet paper. Detach a sheet by holding it between thumb & forefinger at its perforated end exerting a steady pull at an angle of about 10° to the edge of the paper. Carry out the test on ten consecutive sheets of the toilet papers. The sheets shall be severed along the perforations & the tear shall be manifested due to the perforation only

e) Disintegration test

Materials-Water, Plastic bottle (Diameter100mm & height 20cm)

Test specimens-One piece of tissue

Procedure -Place 500 ml of water into plastic bottle. Add one sheet of the specimen in to the bottle. Carry out complete shakes

- **Note**

No	Tissues	Cycles
01	Toilet	3-7
02	Paper	35
03	Facial	25

Normally after above cycles, tissues get separate in to tiny pieces. If it's so then the specimens are good.

f) Grammage test

Apparatus-Balance (Capable of 1mg sensitivity), scissor, watch glass.

Test specimens-One piece of tissue. having area of (10×10)cm^2

Procedure-Cut six piece having area of (10×10) cm^2 from each of specimen.Mesure the mass.Interpret grammage as gm^{-2}(only for one sheet)

g) Strength test

Materials-Rubber bands/cello tape, Weights (10, 20, 50,100,200) g

Procedure-Place one sheet of specimen randomly (record brand on the data sheet) over the top of the beaker having a diameter 60mm. Use a rubber band or cello tape to firmly hold the specimen like a drumhead around the cup. Gently place the weights flat onto the center of the specimen, one at a time. Do not drop the weights on the specimen. Stop as soon as the paper breaks. Count the weights that fell into the cup. Record this value on the data sheet

No	SRI LANKA STANDARD	Toilet papers (2ply)			
	Character	A	B	C	D
1	Grammage, g/m^2 ,min.	17.52	16.42	16.14	15.82
2	Rate of absorption of water (0.01 ml of water),s, max	15	15	18	18
3	Total absorption of water, percent by mass,min	650	589	500	539
4	pH value at 27°C(±2°C)	7.84	8.05	8.23	9.39
5	Dimension a) Area/cm^3,min b) Width/mm,min	110 100	143 110	143 110	108.15 103
6	Disintegration Test	2-3	2-3	2-3	2-3
7	Strength test/g,max	110	150	150	200
8	Ease of separation of sheets (by 10 sheets)	6	6	7	10

Results

Comparison of SLS Characters of four market sample of Toilet papers in Sri Lanka

Conclusion

This research project was carried out to find out whether there are any differences in the performance of different brands of commercially available Toilet papers. There are considerable numbers of brands of toilet papers commercially available in the market place and these different samples perform in different ways. Main objective of this study to determine which brand is the best for the money. The best toilet paper will be one that has a highest absorbency. It should also be strong, but not too strong so that it can disintegrate easily and won't cause any unnecessary plumbing issues. So we can categories the four brands according to their performance as,

1. B
2. A
3. C
4. D

Discussion

All the data were collected under A/C conditions Test method we used only for compare the four brands of toilet papers. So there may be drawbacks. From the results we can see there is a correlation between grammage & total absorption. Strength test was developed to an idea on the tensile strength of the paper.

Reference

1. Tensile breaking strength of water – saturated paper & paperboard (5-year review of T456om-03)
2. The Science of papermaking & paper recycling: A research Experience for students, Lab manual: Measuring paper strength, Author Richard Venditti &Martin Hubb, Associate professor,Department of wood & paper science.
3. SLS 798:2008(Toilet papers)
4. ISO 12625 part 4:2005

G.M.C.Alwis

Chemistry Special part -11

CHEMISTRY IN EVERYDAY LIFE

There are chemical reactions in daily life like, in the way you breathe, the food you eat, the water you drink and in every motion which is taking place around you at every second of the day. Find out what these intelligent mechanisms of nature are, that define chemistry in everyday life.

- Water, which occupies 70% of the earth's surface, is made by two chemical elements, hydrogen and oxygen.
- Soap is an emulsifier which allows oil and water to mix and so the oily mixtures on body and clothes can be removed after application of soap and water.
- Colored vegetables consist of chemical compounds called carotenoids which have an area known as the chromophore. It absorbs certain wavelengths of light and thus there are colored vegetables.
- Food is cooked because of the steam that's present either in the water added or that which is present inside the food items.
- Onions make you cry due to the presence of sulfur in the cells which break after the onions are cut. This sulfur gets mixed with moisture and thus irritates your eyes.
- You feel hungry because of the satiety center in your brain falls short of particular hormones to function and then send the signal of hunger.
- You fall in love, get attracted and have a feeling of belonging because of certain monoamines present in your brain which get stimulated through nerve sensors.If you have wondered, why is the sky blue, it is due to a phenomenon called the "Rayleigh scattering", which depends on scattering of light through particles which are much smaller than the wavelength. Hence when light passes through gases, there is scattering and the sky appears blue.

- Anaerobic fermentation is also a great concept which is present in the chemistry of everyday life. It is present in yogurt, breads, cakes and many other baking products. It is the multiplication of certain useful bacteria which increase the size of the food and make it more filling and soft.
- The food chain present in every ecosystem is also a major part of chemistry in everyday life. Even though it has more biological background, it eventually works because of its chemistry.
- Coffee keeps you awake because of the presence of a chemical called adenosine, in your brain. It binds to certain receptors and slows the nerve cell activity when sleep is signaled.

With these great examples about chemistry in everyday life, there is no other explanation of the existence of earth and its components other than chemistry.

N.B.W.P.Sandaruwan
Chemistry Special part II