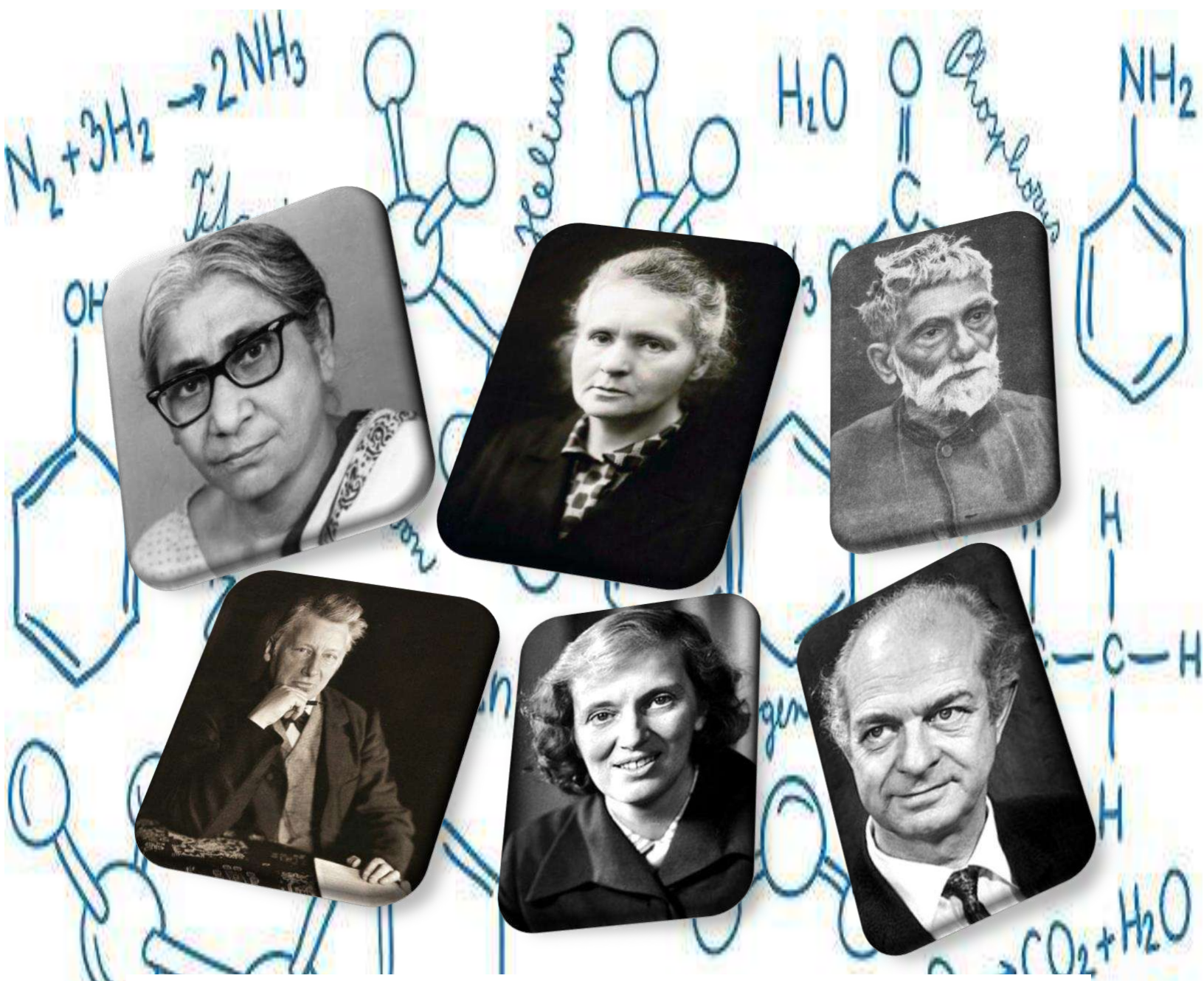


CHEMAZINE

BY DEPARTMENT OF CHEMISTRY

CITY COLLEGE

YEAR : 2020

FOREWORD

I am delighted to know that honours students of the Department of Chemistry are planning to bring out an e-Magazine this year instead of the usual physical version "CHEMAZINE", which was used to be displayed on the walls of the department. Their endeavour in this year of pandemic is all the more laudable because they had no physical contact with the college for ten long months.

I as a senior teacher (retired), would advise to contribute generously different knowledgeable articles and in the process of searching different sources for the materials, use these findings to enrich their knowledge which should be of immense help in their future studies and develop their wisdom in general.

I extend warm Puja greetings to all the teachers and the students and also wish the publication of the forthcoming e-Magazine a grand success.

AMAL KUMAR GOOYEE

ASSOCIATE PROFESSOR (Retd.)

DEPARTMENT OF CHEMISTRY

CITY COLLEGE, Kolkata

ACKNOWLEDGEMENTS

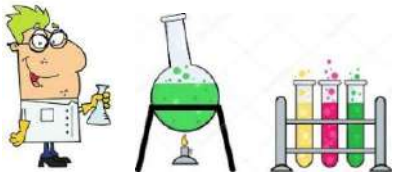
We are extremely fortunate to have a lot of encouragement, support, guidance and assistance from our classmates as well as the Professors of our Department led by our Head of the Department Dr. Sitangshu Shekhar Bhattacharya for the success and final outcome of this magazine.

We express our sincere gratitude to all of them.

Frankly speaking, we did ourselves enjoy a lot to bring out such a piece. It was more like our practical classes – doing research, collecting materials, exchanging with friends and arranging them in an acceptable form and all as a coherent team. We were physically far apart but we really were socially next to each other. A worthwhile project indeed for a good lesson to help our future academic endeavours, so to say.

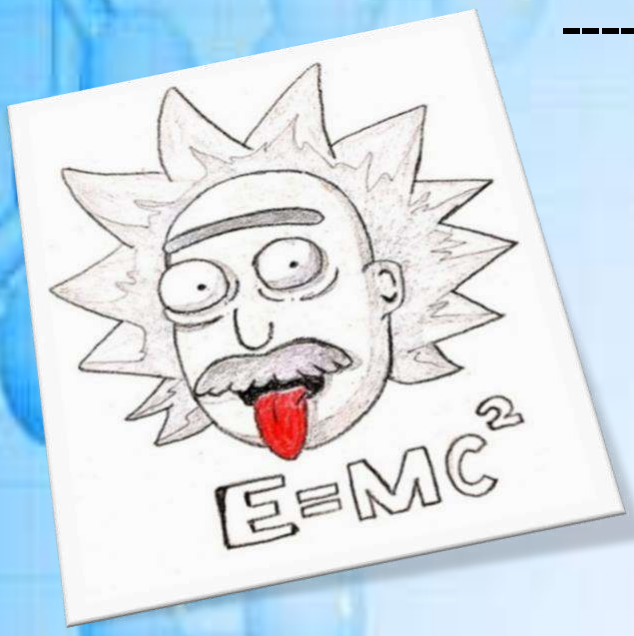
We would love to see our very own CHEMAZINE exist for all the days to come, in physical or e-form whatever, reflecting young minds tuned to the science and arts of chemistry.

CONTENT :



আত্মভোলাদের ইতিকথা

------- *দীপক চৌধুরী*



বিজ্ঞানী’ কথাটা শুনলেই, আমাদের চোখের সামনে ভেসে ওঠে একমাথা উস্কো-খুস্কো চুল আর মুখভর্তি দাড়িওয়ালা কিছু মানুষের ছবি, যাদের মাথায় সর্বদাই তাবড়-তাবড় সমীকরণের দাপাদাপি আর মেজাজে তাঁরা যেন ‘রামগরুড়ের ছানা, হাসতে তাদের মানা’। এহেন প্রচলিত ধ্যানধারনার বিপরীতে, তাঁদের জীবনের কিছুর মজাদার ঘটনাও থাকে, যেগুলির অধিকাংশই আমাদের অজানা। আচ্ছা, একটা ঘটনা শোনাই। ঘটনাটি অক্টোবর, ১৯২৭ এর বিখ্যাত ‘সলভে কনফারেন্স’র, যাতে অংশগ্রহণকারী বিজ্ঞানীদের গ্রুপছবিতে আমরা সচরাচর ক্যাপশন দিয়ে থাকি,‘টু মাচ আই কিউ ইন ওয়ান পিকচার’। সেই সভায় আমন্ত্রিত এক বিজ্ঞানী, পিঠে রুকস্যাক, পায়ে বুট পরে হাজির হন হোটেলে।

রিসেপসনিস্টও যথারীতি তাঁকে পর্বতারোহী ভেবে তাড়িয়ে দেয়। তিনিও নিজের পরিচয় না দিয়েই ফিরে যান। পরে উদ্যোক্তারা ঘটনাটি জানতে পেরে, তাঁকে ফিরিয়ে আনেন। ইনি ছিলেন বিখ্যাত নোবেলজয়ী বিজ্ঞানী **Erwin Schrödinger.** এইরকমই কিছু আত্মভোলা বিজ্ঞানীদের জীবনের কিছু মজার ঘটনা দিয়ে সাজানো, আজকের এই বিশেষ প্রতিবেদন।

আজ থেকে দেড়শো বছর আগে, সূর্যাস্তের পর লণ্ঠন, মশালের আলোই যখন একমাত্র সহায় ছিল, তখনই জন্ম হয় এক শিশুসন্তানের, যে সমগ্র বিশ্বকে আলোয় আলোকিত করে দেয়। দিনটা ছিল ১০ই জুলাই, ১৮৫৬। মধ্যরাতে বজ্রবিদ্যুৎসহ এক প্রকাণ্ড ঝড় উঠলো, বর্তমান ক্রোয়েশিয়ার স্মিলজান নামক এক গ্রামে। সেইরাতেই ডুকা ম্যান্ডিক জন্ম দিলেন এক পুত্রসন্তানের। দাইমা এই শিশুকে অশুভ, অন্ধকারের সন্তান ভাবলেও ডুকা ভবিষ্যদ্বাণী করলেন, “হি উইল বি এ চাইল্ড অফ্ লাইট।” সেই শিশুই, আজকের বিদ্যুৎচালিত সমাজের অন্যতম কারিগর, অল্টারনেটিং কারেন্টের জন্মদাতা – নিকোলা টেসলা।

আত্মভোলা বিজ্ঞানীদের মধ্যে নিউটন, আর্কিমিডিস নামগুলির সঙ্গে অনেকেই পরিচিত। তবে টেসলা যে শুধু আত্মভোলা ছিলেন এমন নয়, নিজের এক আলাদাই জগৎ ছিল তাঁর। গ্র্যাজুয়েশনের পর একবার কলেরায় আক্রান্ত হন টেসলা। আত্মভোলা বিজ্ঞানীদের মধ্যে নিউটন, আর্কিমিডিস নামগুলির সঙ্গে অনেকেই পরিচিত। তবে টেসলা যে শুধু

আত্মভোলা ছিলেন এমন নয়, নিজের এক আলাদাই জগৎ ছিল তাঁর। গ্র্যাজুয়েশনের পর একবার কলেরায় আক্রান্ত হন টেসলা। দীর্ঘ নয়মাস মৃত্যুশয্যায় পড়ে থাকার পর ভাগ্যবলে, রবিঠাকুরের মতোই "আমি মৃত্যু- চেয়ে বড়ো" হুঙ্কারে পুনরায় স্বাভাবিক জীবনযাত্রায় ফিরে আসেন তিনি। তবে এই মহামারীর নাগপাশ থেকে মুক্ত হওয়ার পর, টেসলা জীবাণু নিয়ে 'অবসেসিভ' হয়ে ওঠেন; ১৮ টি রুমাল দিয়ে প্রত্যহ ডাইনিং রুম মুছে, হাতে সাদা গ্লাভস পরে ডিনার করতেন তিনি। বয়স বাড়ার সাথে সাথে তাঁর এই ও.সি.ডি (অবসেসিভ-কম্পালসিভ ডিসঅর্ডার) এক অন্য মাত্রা নেয়; ‘তিন’ সংখ্যাটির প্রতি তিনি এতটাই আছন্ন হয়ে পড়েন, যে কোনো বাড়িতে ঢোকার আগে, তিনি তিনবার সেটি প্রদক্ষিণ করতেন। তেমনই ‘মুক্তো’ দেখলে তিনি বেজায় খচে যেতেন। এমনকি, একদিন তো তিনি তাঁর সেক্রেটারিকে, মুক্তোর গয়না পরে আসায়, সেদিনের জন্য বাড়ি পাঠিয়ে দেন।

এই প্রসঙ্গে, একটি বেশ মজার ঘটনার উল্লেখ করা যায়। টেসলার গবেষনার জন্য, ম্যানহাটন ল্যাবে তাঁর একটি ভূকম্প-মেশিন ছিল, যার কম্পনে জড়ো হতেন আশেপাশের মানুষজন -তা সে কৌতুহলের বশবর্তী হয়েই হোক বা বিরক্তিতেই। তাঁর এই মেশিনের কম্পন, বাড়িঘর ধুলিস্যাৎ করার ক্ষমতা না রাখলেও, একটি ভয়ানক সমস্যাকে ধুলিস্যাৎ করে দেয় । লেখক কার্লসনের কথায়, It did ‘shake the poop out of Mark

Twain' (পাছে অনুবাদ করতে গিয়ে তার অঙ্গহানি করে ফেলি, তাই লাইনটি সরাসরি তুলে ধরলাম)। আসলে, টোয়েনের ভালো বন্ধু হওয়ার দরুন, টেসলা তাঁর কোষ্ঠকাঠিন্যের ব্যাপারে ওয়াকিবহাল ছিলেন। তাই তিনি একদিন টোয়েনকে আমন্ত্রন জানিয়ে, একটি ছোট্ট প্ল্যাটফর্মের ওপর তাঁকে দাঁড় করিয়ে, মেশিনটি চালিয়ে দেন। প্রায় ৯০ সেকেন্ডের পর, মেশিনের কম্পনে বিচলিত হয়ে, টোয়েন একলাফে প্ল্যাটফর্ম থেকে নেমে, দৌড় লাগান বাথরুমের উদ্দেশ্যে।

সাধারণ মানুষদের কাছে, এই দৈনন্দিন জীবনের সুখসুবিধা সম্পর্কে উদাসীন মানুষগুলো খ্যাপাটে, পাগল বলে বিবেচিত হলেও বাস্তবে কিন্তু এনারা বেশ জীবন্ত। এরকমই একজন 'full of life' মানুষকে নিয়ে দু-চার কথা না লিখলে, হয়তো এই লেখাই অসম্পূর্ণ থেকে যায়। ইনি হলেন কোয়ান্টাম ইলেক্ট্রোডাইনামিক্সের এক উজ্জ্বল নক্ষত্র, নোবেলজয়ী বিজ্ঞানী, রিচার্ড ফাইনম্যান। আত্মভোলা, ফুর্তিবাজ, দুষ্টুমিতে ভরপুর এই ভদ্রলোকের অটোবায়োগ্রাফি, 'Surely You're Joking, Mr. Feynman!'-এর নাম শোনার পর আলাদা করে তাঁর স্বভাবপ্রকৃতি বর্ণনার কোনো প্রশ্নই ওঠেনা। নোবেলপ্রাপ্ত তাবড়-তাবড় বিজ্ঞানী বেথে, ফ্রাঙ্ক ইত্যাদিদের মুখের ওপর ফাইনম্যান–'কি বকছেন স্যার, পাগলের মতো' বলে দিতেন অনায়াসেই । এই প্রসঙ্গে, নোবেলজয়ী বিজ্ঞানী নীলস্ বোরের সাথে ফাইনম্যানের একটা মজার ঘটনার উল্লেখ করাই যায়।

নীলস্ বোর, পরমাণুর গঠন তথা কোয়ান্টাম মেকানিক্সের একজন অন্যতম কর্ণধার, একবার লস অ্যালামাসের বিজ্ঞানীদের একটি নতুন তথ্য জানাতে হাজির হন। বোর জানতেন, তাঁর থিয়োরিটা সকলেই বিনা বাক্যব্যয়ে মেনে নেবেন; তাঁর প্রতি শ্রদ্ধায়, সৌজন্যে কোনো প্রতিবাদ করবেন না, শুধুমাত্র একজন ছাড়া- রিচার্ড ফাইনম্যান। তাই লেকচারের আগেরদিন রাতে, ছেলে অ্যাগী বোরকে দিয়ে, তিনি ডেকে পাঠান ফাইনম্যানকে। প্রফেসর বোরের মতো একজন বিশ্ববিশ্রুত বিজ্ঞানী তাঁকে চেনেন, এই ভেবেই প্রথমে অবাক হয়ে যান ফাইনম্যান। তিনি তড়িঘড়ি করে সেখানে পৌঁছালে, বোর তাঁকে নিজের রিপোর্ট দেখান। 'লস অ্যালামাসের এতো গুণী ব্যক্তিরা থাকা সত্ত্বেও কেনো আমি' ভেবে প্রথমে একটু হতবাক হলেও, মিনিট দশেকের মধ্যেই বাহ্যজ্ঞান লুপ্ত করে, আকণ্ঠ অঙ্ক-সমুদ্রে ডুব দেন ফাইনম্যান। অল্পসময় পরেই ফাইনম্যান হঠাৎ চিৎকার করে ওঠেন,

-'What is this Sir! There are eight unknowns and seven equations, how can you solve it? Are you nuts!! '

নোবেলজয়ী পিতাকে, অ্যাগী আগে এভাবে অপমান করতে দেখেনি কাউকে । কর্ণমূল লাল হয়ে ওঠে তার। বোর কিন্তু নির্বিকার। তিনি ফাইনম্যানের কথায় সম্মতি জানিয়ে বলেন যে, অষ্টম ইকয়েশনটাও তাঁদের হাতেই আছে – বলে একঝাঁক 'ফাই- থিটা- এপসাইলনে' ভরপুর

ভরপুর ইকুয়েশনে ভরিয়ে দেন ব্ল্যাকবোর্ড।

ফাইনম্যান বললেন –‘I see. Let’s solve it then ’।

রাত তিনটে নাগাদ শেষ হলো অঙ্কটা। ভোররাতে প্রফেসরকে বিদায় জানিয়ে বেরিয়ে গেলেন ফাইনম্যান। ওনাকে গাড়ি অব্দি ছাড়তে আসে অ্যাগী। ফাইনম্যান অনেকক্ষণ ধরেই, এতো গুণীজন থাকা সত্ত্বেও, তাঁকে ডাকার কারণ জানতে অধীর ছিলেন;এবার সুযোগ বুঝে জিজ্ঞেসই করে বসলেন অ্যাগীকে। অ্যাগী জানালো যে, তাঁকে ডাকার একমাত্র কারণ এই, যে একমাত্র তিনি ছাড়া বোরকে মুখের ওপর প্রশ্ন ছুঁড়ে, ‘Nuts’ বলার ক্ষমতা সেইসব গুণীজনদের যে নেই, এটা বোর জানতেন। এইশুনে, আঁতকে উঠলেন ফাইনম্যান,

-‘You mean I will call Dr. Bohr nuts? Are you nuts?’

এই ধরনের মানুষকে আত্মভোলা বা ‘Unconventional’ বলবেন না তো কাকে বলবেন। ফাইনম্যানের কীর্তিকলাপ সবিস্তারে লিখতে গেলে, আলাদা করে একখানা বই লিখতে হয়। তবে আরও একজন ব্যাক্তিত্ব আছেন, ‘আত্মভোলা’ আর ‘বিজ্ঞানী’- এইদুটো কথা শুনলে একবাক্যে যার নাম মনে পড়ে, যার নাম আর বিজ্ঞানে তাঁর অবদান কমবেশি সবারই জানা, সেই বৈজ্ঞানিক অ্যালবার্ট আইনস্টাইনের কার্যকলাপ শুনলে আপনি আঁতকে উঠতে বাধ্য; একজন ‘all time genius’ হওয়া সত্ত্বেও, নিজের ফোন নাম্বারও টেলিফোন ডাইরেক্টরীতে হাতড়ে বেড়ানো,

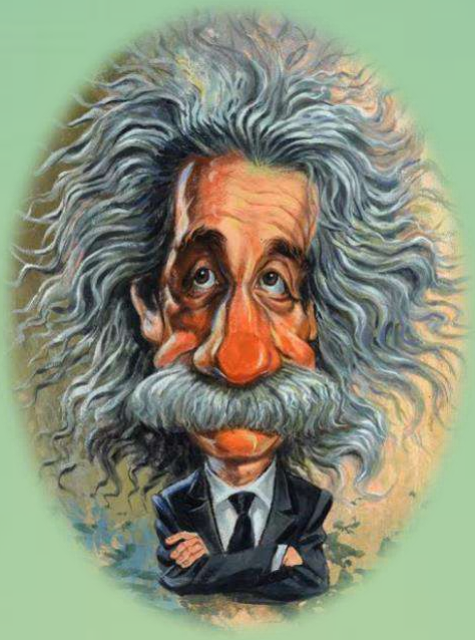
এই আত্মভোলা মানুষটির, একটি ছোট্ট ঘটনা দিয়ে আজকের প্রতিবেদনটির ইতি টানবো।

আইনস্টাইন একবার প্রিন্সটন থেকে ট্রেনে করে ফিরছিলেন। ট্রেনের টিটি তাঁর কাছে এসে টিকিট চাইলে, তিনি নিজের বুকপকেটে হাত দিয়ে দেখলেন, টিকিট নেই। তারপর তিনি তাঁর প্যান্টের পকেট হাতড়ালেন, তাও পেলেন না। ব্রিফকেস খুলে দেখলেন, নাহ্ সেখানেও নেই টিকিট। এরপর তিনি পাশের সিটে খোঁজাখুঁজি শুরু করলেন, কিন্তু সেখানেও টিকিট পাওয়া গেলনা। তাঁকে এতো হন্য হয়ে খুঁজতে দেখে টিটি বললো, 'ডঃ আইনস্টাইন, আমি আপনাকে চিনি। আমরা সবাই জানি, আপনি কে। আমি নিশ্চিত, আপনি টিকিট কেটেছেন। আপনি নিশ্চিন্ত হয়ে বসুন'। আইনস্টাইনও ঘাড় নেড়ে সম্মতি জানালেন। এরপর টিটি সকলের টিকিট চেক করে, যখন অন্য কামরায় যেতে প্রস্তুত হলেন, তিনি দেখলেন, এই মহান পদার্থবিদটি হাঁটুমুড়ে, হাতে ভর দিয়ে বসে সিটের নিচে টিকিট খুঁজছেন। টিটি ছুটে গিয়ে বললো, 'ডঃ আইনস্টাইন, চিন্তা করবেন না। আমি জানি আপনার পরিচয়। কোনো অসুবিধা নেই। আপনার টিকিট লাগবেনা। আমি নিশ্চিত, আপনি টিকিট কেটেছেন'।

আইনস্টাইন এটা শুনে টিটির দিকে তাকিয়ে বললেন,

-**'Young man, I too, know who I am. What I don't know is where I am going'.**

..... সমাপ্ত .....



Fun fact : ***Do you know , every hydrogen atom in your body is likely 13.5 billion years old because they were created at the birth of the universe .***

RECENT TREND ON BIODIESEL PRODUCTION

---- Pramita Ghosh

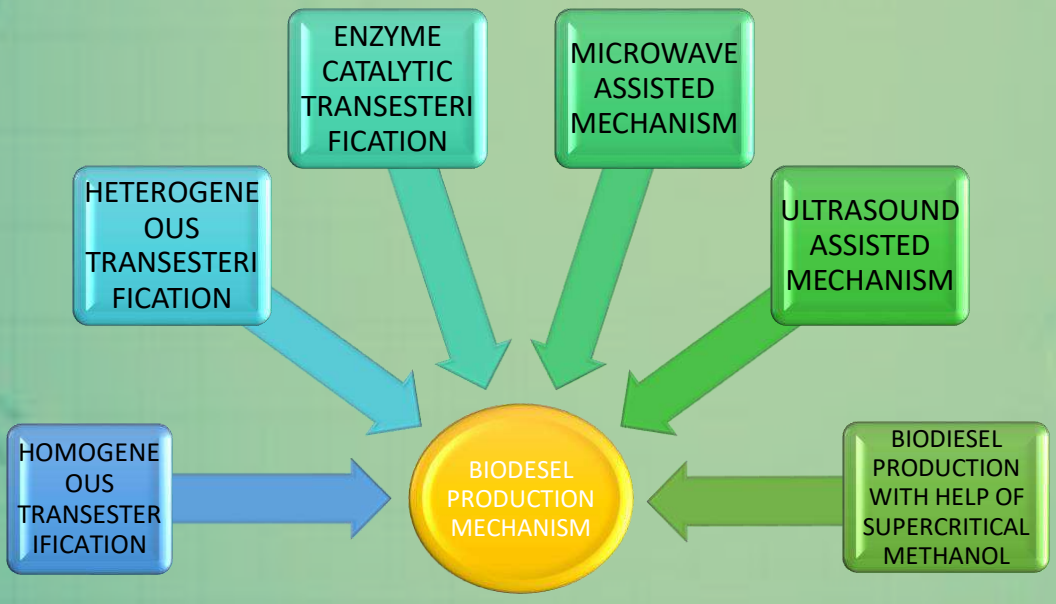
With decline of the fossil fuel resources, it is of paramount importance to find alternative to diesel. Also, emissions out of diesel engines can result in adverse environmental effects. Today huge amount of fossil fuelsuch as oil, coal and natural gas are being consumed. Although these fuels are being produced in deep underground under high temperature and pressure, the rate at which those are being consumed is far more than their production rate. In this regard, these sources are classified as non – renewable resources. To compensate for this problem while reducing the emissions out of these fuels, renewable and alternative sources of energy such as hydrogen, solar, wind and biofuels have been used to reduce greenhouse gas emissions caused by fossil fuels. According to American society of tasting and materials (ASTM), biodiesel is a fuel composed of mono – alkyls of long chain fatty acid esters which can be obtained from different renewable raw materials such as vegetable oils and animal fats. Biological origin and renewability of this fuel are the most important properties in which they differ from conventional diesel, which is derived from oil and fossils. Biodiesel can be used either in pure form or in combination with diesel. As an alternative fuel, biodiesel has numerous advantages such as renewability, which can eliminate the need for importing fossil fuel

WHAT IS BIODIESEL?

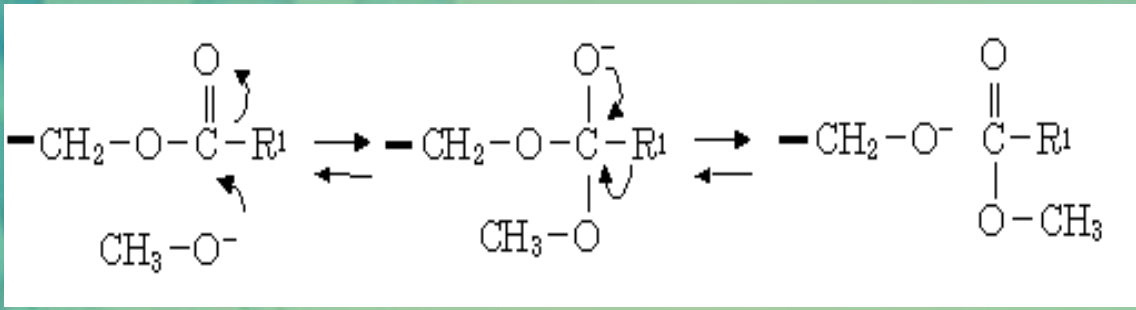
Made from an increasingly diverse mix of resources such as recycled cooking oil, soyabean oil and animal fats, biodiesel is a renewable, clean – burning diesel replacement that can be used in existing diesel engines withoutmodification. It's the nation's first domestically produced commercially advanced biofuel.

FIGURE 1: ANIMAL FAT AND BIODIESEL PRODUCED FROM ANIMAL FAT

Production procedures



- *HOMOGENEOUS TRANSESTERIFICATION*
  - Acid and base catalyzed, both method are used
  - Triglyceride in animal fat or other feedstock are processed with excess methanol to form methyl ester (biodiesel)
- *HETEROGENEOUS TRANSESTERIFICATION*
  - More convenient method than homogeneous method because of high purity of product
  - Such heterogeneous catalysts are: zeolight, ion exchange resin, heteropolyacids, sulphonated carbon
- *ENZYME CATALYTIC TRANSESTERIFICATION*
  - Useful method for naturally occuring enzyme
  - Biodiesel production method follow Micheali – menten kinetic model
- *BIODIESEL PRODUCTION WITH HELP OF SUPERCRITICAL METHANOL*
  - High temperature and pressure are required for this process. High yield of biodiesel production
  - Limitation is only due to high production cost
- *ULTRASOUND ASSISTED MECHANISM*
  - Maximum biodiesel production with minimum energy consumption
  - Upcoming field of research
- *MICROWAVE ASSISTED MECHANISM*
  - Energy transfer instead of heat transfer to the material
  - Increased efficiency of the product



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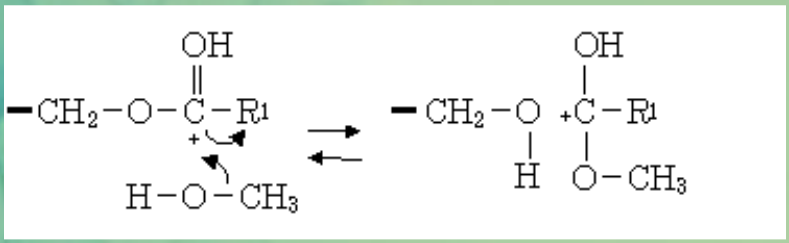

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FIGURE 2: TRIGLYCERIDE TRANSESTERIFICATION MECHANISM (a) BASIC MEDIUM AND (b) ACID MEDIUM

ADVANTAGE OF BIODIESEL:

- *Less carbon emission*
- *Environment – friendly*
- *Clean fuel*
- *Also used in diesel engine*
- *Cheap and easily producible due to availability of feedstock*

DISADVANTAGE OF BIODIESEL:

- *Variation in the quality of biodiesel as it is made from a variety of biofuel crop*
- *Food shortage*
- *Excess use of fertilizer cause soil damage*
- *Regional sustainability*
- *Sometime clogging in engine*
- *Biodiesel can harm rubber houses of some engines*
- *Biodiesel is more expensive than petroleum oil*

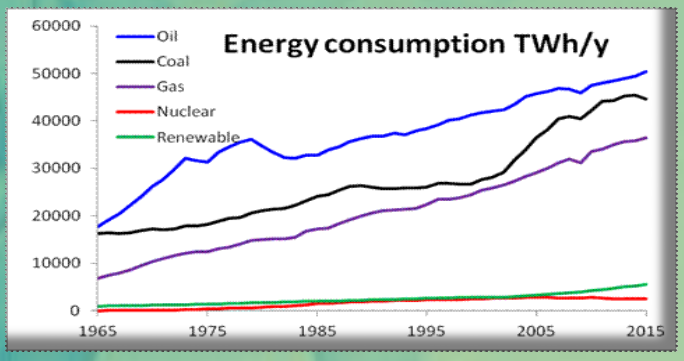


FIGURE 3: WORLDWIDE INCREASING CONSUMPTION OF PETROLEUM

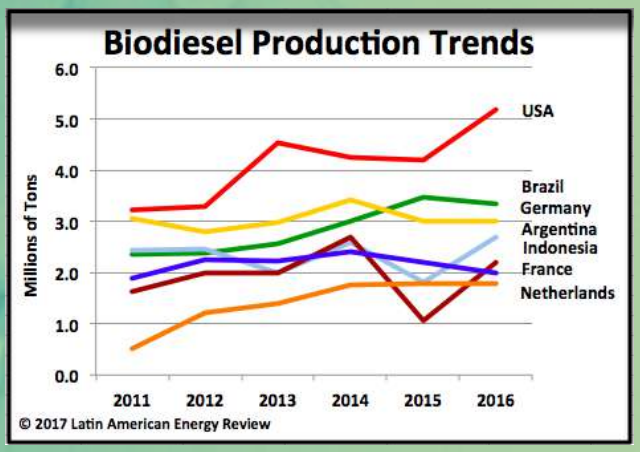


FIGURE 4: YEARWISE BIODIESEL PRODUCTION INCREASING TREND

FUTURE SCOPE:

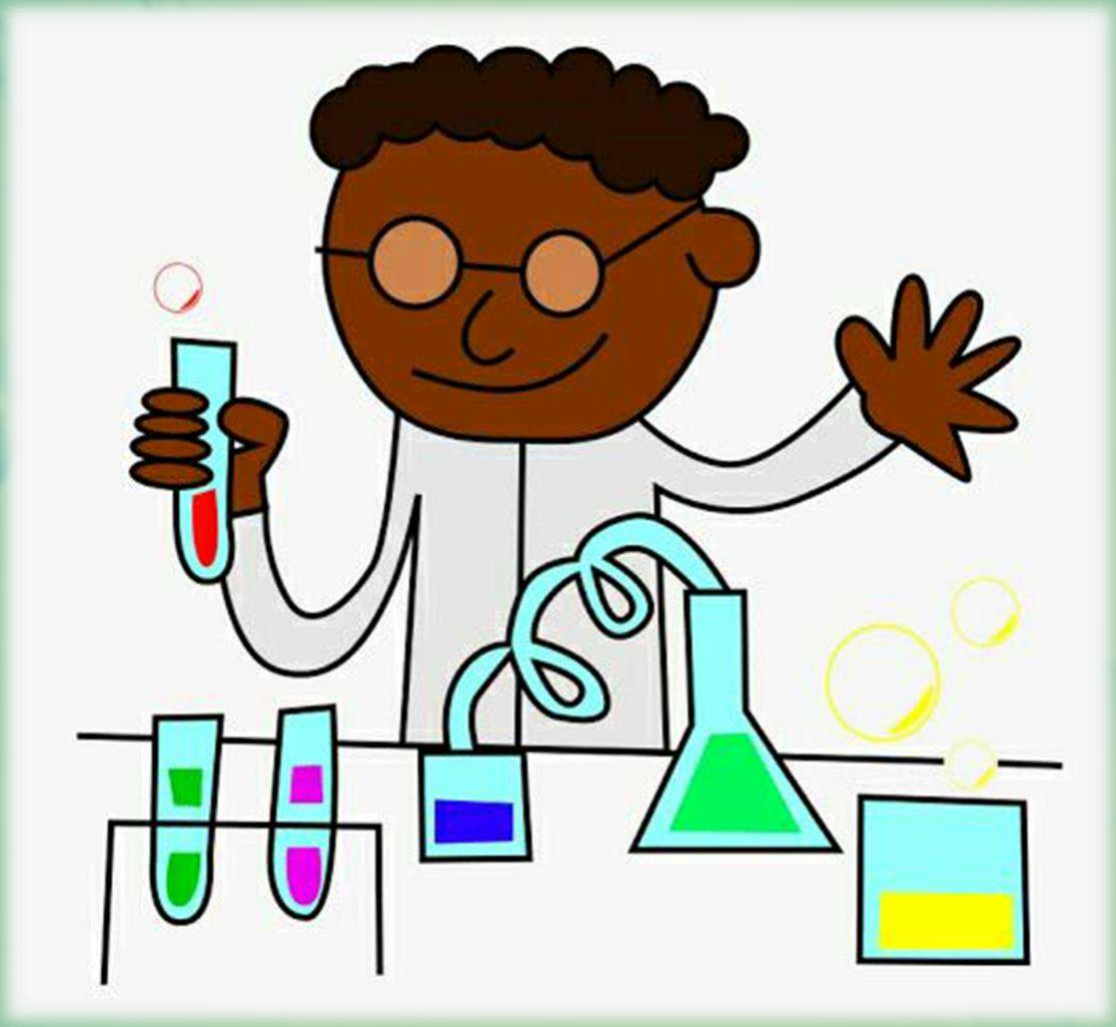
Higher costs of producing biodiesels relative to fossil – based fuels drive the studies on optimizing biodiesel production condition. It is a very interesting upcoming field of research to improve production methods, reaction conditions and mainly price.

REFERENCE:

1) A review on microwave-assisted biodiesel production
Behzad Khedri, Mostafa Mostafaei & Seyed Mohammad Safieddin Ardebili

2) **Theoretical Study of the Transesterification of Triglycerides to Biodiesel Fuel under Various Conditions**
Y. Asakuma**1, O. Kawanami1, K. Maeda1, H. Kuramochi2 and K. Fukui1
1 University of Hyogo, Himeji, Japan
2 National Institute of Environmental Study, Tsukuba, Japan

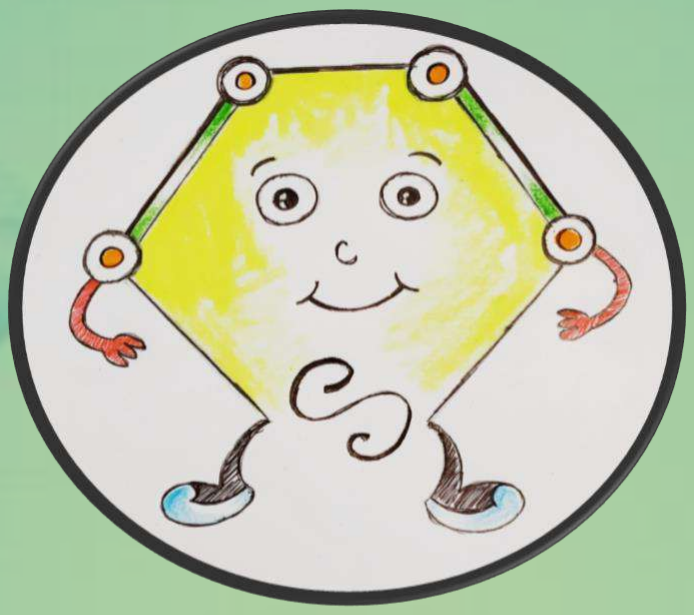
3) www.google.com



Fun fact : Do you know , the only letter not appearing in the periodic table is J .

INVENTION OF THIOPHENE

-Siddhartha Das(3rd year)



Drawing-Arup Biswas(5th sem)

Thiophene is a heterocyclic compound with the formula C4H4S,consisting of a planar five membered ring.It is aromatic as indicated by it's extensive substitution reactions.It is a colourless liquid with a benzene like odour.It is obtained via coal tar distillation.In which fraction of coal tar distillation,benzene is obtained,thiophene is obtained in the same fraction,because the resonance energy of benzene and thiophene is almost same.[For benzene,it is 36 Kcal/mole,and for thiophene,it is **29** Kcal/mole.But benzene is six membered and thiophene is five membered compound.Hence resonance energy per atom is approx 6 Kcal/mole for both the cases]

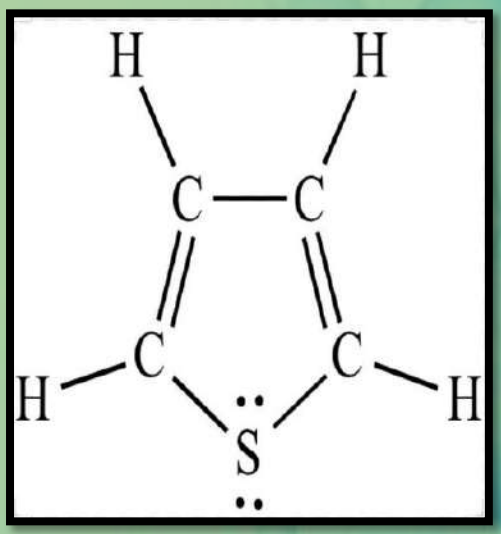
.

It was 1882.At that time,Organic Chemistry was not a matter of fact .If anyone heated up some branch or leaf and it started to change it'scolour,then people thought that was a big experiment.But what was the actual matter? Nobody was well aware of the actual reasons.At that time Viktor Meyer of Germany was a great personality

He observed that in presence of catalytic amount of Sulphuric acid,colourless benzene and para N,N diaminobenzaldehyde reacts to give a deep red coloured compound.He had showed this reaction in various workshops of schools and colleges and got praised for.

Once Viktor Meyer was invited to attend an International conference in USA ...

Viktor Meyer



Thiophene

He knew that beside giving the lecture,he had to perform this reaction on special request. So for that he carried inevitable reactants and apparatus with him

As usual he was requested to show the reaction*. But shockingly it did not turned out as it was expected to be!*

He tried again,but failed.But he had successfully performed this reaction several times.As a result,people who were present in the conference were laughing at him

.He felt insulted.There was a line written in his biography,"It was everyone's delight except the scientist and his assistant.Then he came to backstage and asked his assistant that every necessary equipments were rightly brought or not

Then his assistant confessed that one day before the programme,the benzene bottle that was brought with him had fallen from his hand.Then he searched for it in local laboratory but they were unable to give it.Instead of benzene,they gave benzoic acid and from that he prepared benzene by distilling out with sodalime.Then Viktor Meyer thought that there is nothing wrong in it but why was the reaction not turned out the way it should be?

Later it was revealed that the benzene they had generally used was commercial benzene,which was obtained via coal tar distillation and the benzene which was obtained via decarboxilation of benzoic acid, was pure benzene.Then Viktor Meyer thought that there must be some other substance present in commercial benzene as impurity,for which the reaction mainly happens.From there,a new compound was invented.Viktor Meyer named it ***'THIOPHENE'*.**

This Thiophene is present in the biotin skeleton of Vitamin.Since the resonance energy of both benzene and thiophene is almost identical,hence their properties are also near about same.Thus it is a difficult task to separate them.For this reason,there is a trace amount of Thiophene impurity present in commercial benzene.

Reference-Wikipedia

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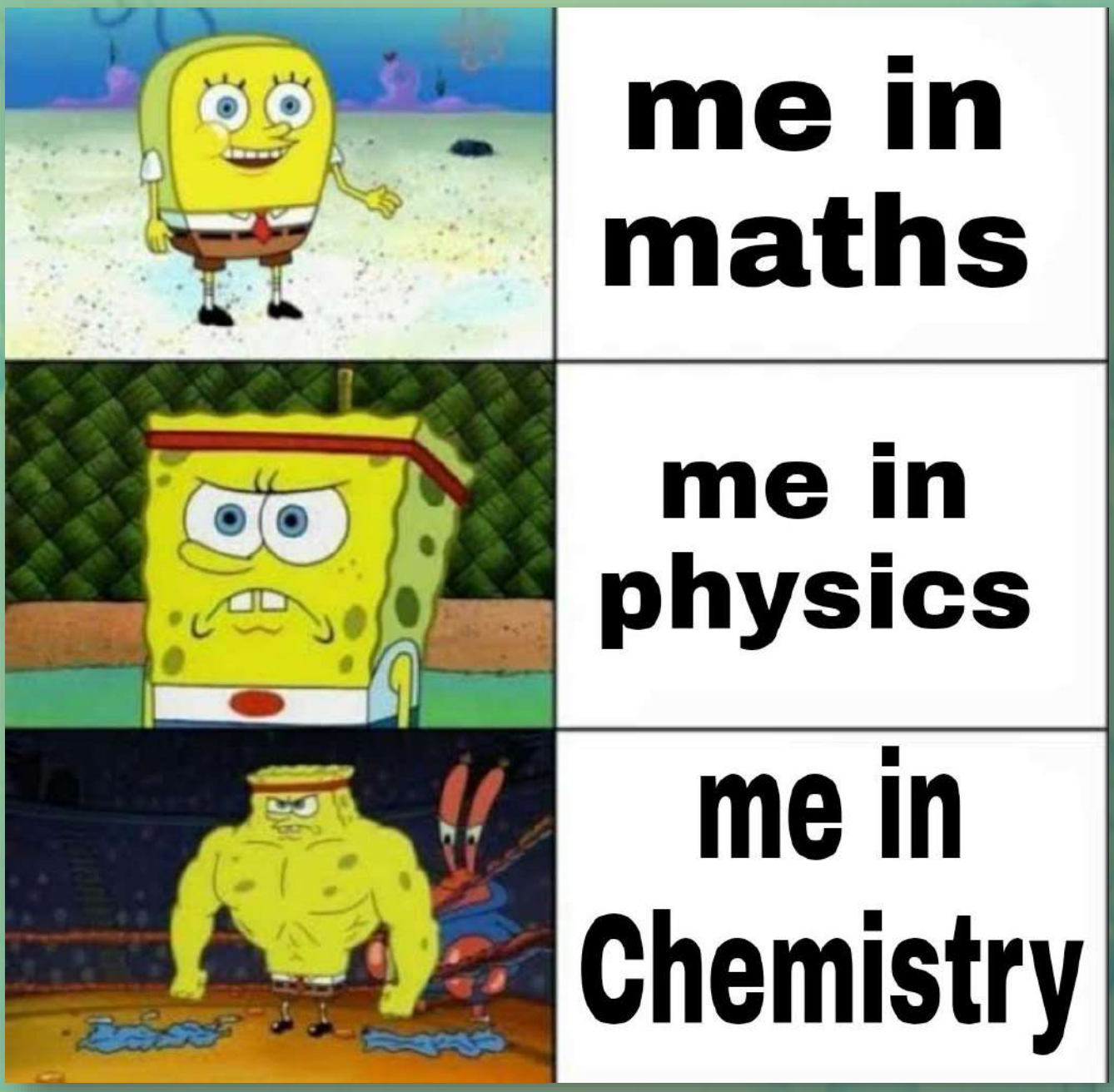
Fun fact : **Do you know , Magnesium is named for the Greek city of Magnesia, a source of calcium oxide, which is called magnesia.**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ACCIDENTAL INVENTIONS THROUGHOUT THE CENTURY

---- Sohini Khan (3rd year)

Suppose your ship wrecks and you end up in a deserted island just like Robinson Crusoe (most you must have imagined yourself in this adventure at least once ain't it?)Now the basic necessities would be-water, food and fire. You find a matchbox in your pocket!!!(You can dry it to use, of course!)You thank the gods since the problem of making a fire is at least eased a bit and that too by a tiny box that costs just 1 rupee and is hardly 10gms in weight.

Well, lighting a fire may not be so easy even today if it was not accidentally discovered by British pharmacist John Walker in 1826 (In 1827, English pharmacist John Walker was stirring a pot of chemicals that included antimony sulfide and potassium chlorate, and then he noticed this dried lump at the end of his mixing stick. Now, he tried to scratch it off, but it burst into flames)

this article I am going to talk about some of such important accidental scientific inventions which shaped the path of future research. I would also like to highlight about some stuffs we use in daily life which are actually there as a result of accidental inventions.

SOME POPULAR ACCIDENTAL INVENTIONS IN CHEMISTRY:

MICROWAVE

Baking any dish in seconds which is a reality now was a myth before 1940 when Percy Spencer, an engineer, was working under a U.S. company Raytheon (dealing with wartime magnetron tubes used in radar defence, at that time).One day while working on a magnetron he found at a chocolate bar in his pocket had melted faster than he expected.

Spencer discovered it was due to emission of microwaves.

The first kind of microwave

Several experiments were held. The first two foods to be intentionally heated with the tube were popcorn and an egg. The corn popped but the egg exploded when placed near the tube. To test his theory about the tube, Spencer created a high-density electromagnetic field by feeding microwave power into a metal box. The internal temperature of the food placed inside the metal box began to rise rapidly.

Spencer and the Raytheon Corporation filed for a patent for a method of treating foodstuffs on October 8, 1945. US Patent 2,495,429 was granted on January 24, 1950.Later this was improvised and the first microwave to be used at home was introduced in 1976

POLYTHENE:

Though it's a problem now-a-days and replacements are in quest ,one cannot ignore its undeniable utility throughout last few decades!

In March 27,1933 first industrially practical polythene synthesis was discovered by Eric Fawcett and Reginald Gibson by accident, at ICI (Imperial Chemical Industries) in Northwich, England. During high-pressure experiments on ethylene, a test vessel had leaked and a trace of oxygen was present in the chemists' fresh ethylene sample, acting as an initiator. Polyethylene formed overnight.ICI saw it's use and moved forward for its patent.

Polyethylene's production did not become common until the late 1950s and not until the 1970s when magnesium chloride was used for better flexibility.

Now polythene is an important part in our day-to--day life.

TEFLON (PTEE-polytetrafluoroethylene)

One might not recognize it by name, but teflon is a synthetic polymer used to make everything from nonstick cooking pans to nail polish. And though it's a genius invention that changed the way we cook, clean, and groom, the man who discovered the product—**Roy J. Plunkett**—did so completely by accident. The scientist was working at the DuPont Company's Jackson Laboratory in 1938 researching refrigerants (which help to supply air conditioning and refrigeration) when he noticed that some of his gas had turned into a white power. After some testing, Plunkett concluded that the substance was heat-resistant with low surface friction, giving it the perfect properties for its many uses we see today.

Roy J. Plunkett

VIAGRA:

Viagra was the first treatment for erectile dysfunction, but that isn't what it was originally tested for. Pfizer introduced the chemical ***Sildenafil***, the active drug in Viagra, as a heart medication.

The blue pills that brought a revolution in the drug-industry.

During clinical trials the drug proved ineffective for heart conditions. But men noted that the medication seemed to cause another effect – stronger and longer-lasting erections. Even if they hadn't been able to maintain an erection before, the ability returned while they were on Viagra

INSULIN

In 1889, two doctors at the University of Strasbourg, Oscar Minkowski and Josef von Mering, were trying to understand how the pancreas affected digestion, so they removed the organ from a healthy dog.

A few days later, they noticed that flies were swarming around the dog's urine - something abnormal, and unexpected.

They tested the urine, and found sugar in it. They realized that by removing the pancreas, they had given the dog diabetes.

Those two never figured out what the pancreas produced that regulated blood sugar. But during a series of experiments that occurred between 1920 and 1922, researchers at the University of Toronto were able to isolate a pancreatic secretion that they called insulin.

Their team was awarded the Nobel Prize, and within a year, the pharmaceutical company Eli Lilly was making and selling insulin.

Can you imagine the lives of diabetic patients right now, had there been no discovery of Insulin!

LSD (lysergic acid dietylamide):

Albert Hoffman was trying to stabilize lysergic acid, a derivative of a fungal compound used in a migraine medicine. He ended up synthesizing a compound called lysergic acid diethylamide, or LSD. Later, he accidentally exposed himself to it and felt dizzy with hallucinations. On April 19, 1943, he tested it on himself again and needed a lab assistant to help him home.

- *Edited by* **Sayantan Chakraborty(5th Sem)**

,

Now, maybe it's not a discovery that is helpful in any way as LSD can affect one's mental health only in a negative way, and it has not benefited mankind as such. Let's just say it's one of the curse that found its existence through an accident!

The effects of LSD are- sleeplessness, tremors and user can become fixated on the intensity of certain colours etc

Several other example of such accidental discoveries can be laid forward such as,most notable ones being- X-Rays, Radioactivity(I have not mentioned about them since these discoveries are already popular, instead I have tried to highlight the 'not-so-popular' discoveries that have greatly impacted our society, here) Velcro, superglue (cyanoacrylate), penicillin, champagne, etc. which are parts of our lives and have benefited us in every way possible. God knows where we would stand today had something creative like this, not emerged in form of unexpected results

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--- Image source Google

Fun fact : Do you know , Slumdog Millionaire 's iconic scene which sees a child fall into a sewer was only made possible thanks to peanut butter and chocolate sauce.The stomach-churning scene was obviously created with the use of special effects of sorts - and the child star was desperate to jump into the 'toilet' so he could lick it all off.

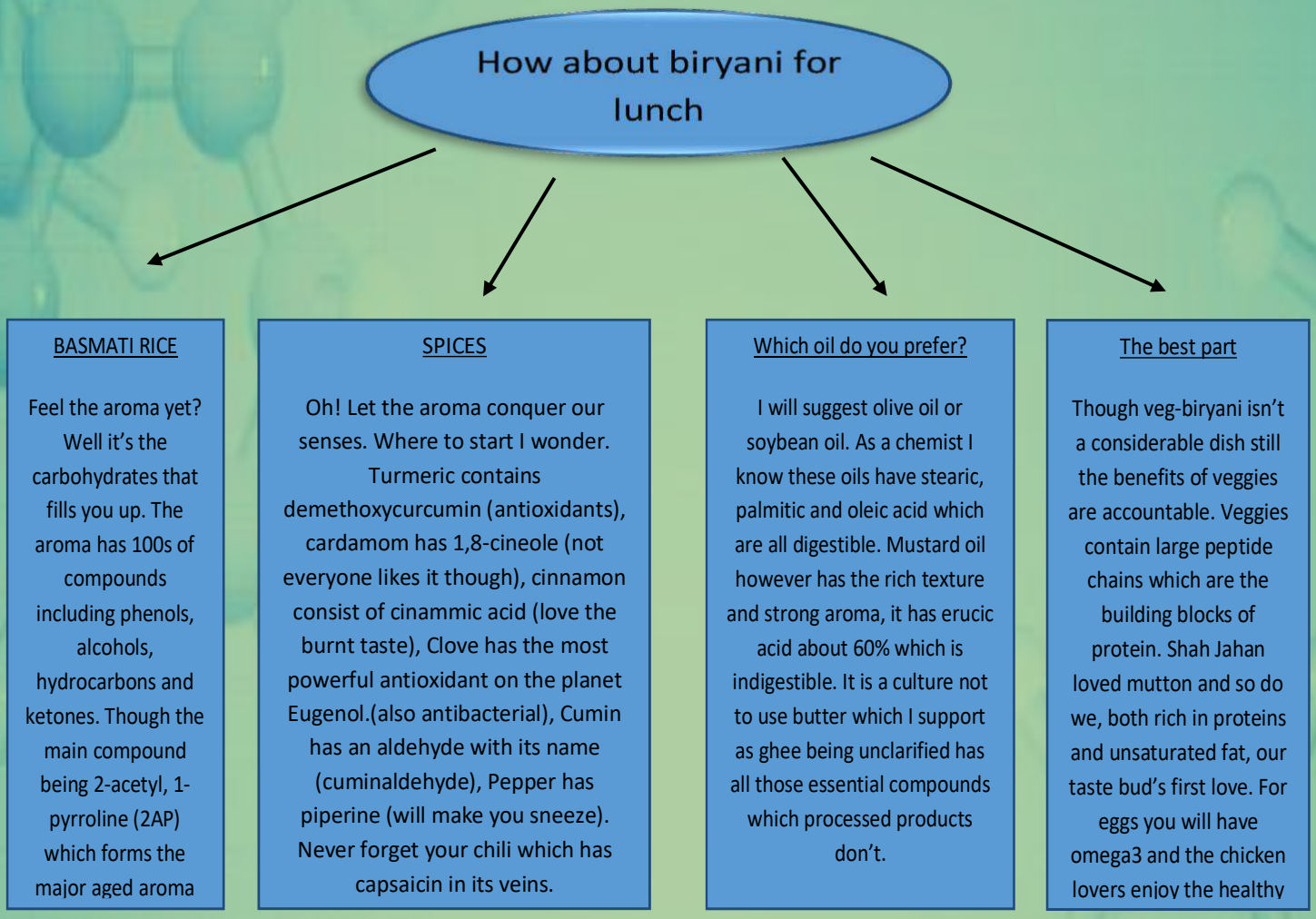
IS CHEMISTRY TASTY?

AMRITA KONER

SOUMYADEEP MUKHERJEE

Have you ever imagined what fills our plates and our tummy?Food right? Well nowadays we are cool if we update our social status with colorfully decorated gourmet dishes. Now what if I tell that behind those colors, the smell, the taste which constitutes a delicacy lies dozens of chemical compounds, molecules so big that won't even fit in your plate. Now don't worry you food lovers these compounds are naturally occurring and almost all of them are suitable for our body. *So where lies the beauty?*

Chemistry lies in every spoonful you take. You just need the eye for it. From veggies to spices, from meats to oils, savory, sweet you name it, has a hidden compound that enlightens the flavor, smell and color. And they have health benefits too, except of course for the appealing alcoholic drinks which will make you go tipsy. *Any favorites*? *"Fried chicken lovers- beware of the oil". "Chili lovers- do you know the spicier you go, the more you increase your protein intake". Well more of that later- let first take a dive into everyday food. The flow chart will develop a taste.*



We consider our lunch healthy and indeed it is. A complete meal full of chemistry. *Wait there*! We are not done. Do you know that all these compounds are natural products and the synthetic organic chemists work their day and night out in the laboratory to replicate these molecules? There are now millions of flavoring agents in your nearby stores, which are both instant and rich. *As japan has their all flavor kitkats, we have our biryani flavored instant noodles. Sounds nasty right?*

Since we had our lunch how about desert? We all fancy our ice cream

'Ice cream' just sounds delicious. The first choice of every foodie. A creamy gesture with lots of milk and variety of flavours. An ice cream type of food was eaten in China first time in 618- 97AD. In ancient history it was found that Roman emperors sent slaves to mountain top to bring back fresh ice which was then further flavoured and served as ice cream. Thereafter in Europe and in early America it became popular and they invented the common method of producing icecream and also developed its taste. Actually ice cream is a type of emulsion, a combination of fat and water that usually wouldn't mix together without separating. It is a combination of ice crystal, air, sugar and milk. There are various types of flavours like Vanilla,Chocolate, Walnut, Butterscotch Ribbon and otherflavours and colours are made artificially. Natural dyes such as anthocyanins can then be added to ensure the ice cream is the correct colour. Main ingredients are milk sugar and protein. Its taste so good because of fat. Each should contain minimum 10 percent of fat. Some stabilizers like gelatin, egg yolks are also used to prevent large crystal formation which to melt an ice cream.

Although the chemistry behind ice-cream is interesting but never forget to bite a bit rather than think.

MILKY IT IS

Main ingredient being milk, the calcium and protein is yours. Milk's main constituent is lactose- a disaccharide made of galactose and glucose (if you are lactose intolerant it means that your body does not produce the enzyme lactase which breakdown lactose). Don't worry almond milk is tasty too. Anyways you have casein a high quality protein in milk.

NAME your FLAVORS

Chocolate has theobromine, the flavoring agent for cacao plants.

Like caramel or nougat or marshmallow? They all are sugar syrup and corn syrup.

Almond flavor comes from benzaldehyde and vanilla has vanillin.

Colorful isn't it?

Anthocyanin, a natural dyes is used. Besides that edible synthetic alternatives are also available which are a bit unhealthy too.

Desert was delicious indeed and the chemistry in it was awesome too. Well these days you don't have to visit an ice cream store to buy you favorite, online stores got you. They have developed techniques to deep freeze your ice cream using liquid nitrogen up to a jaw dropping -170◦c. So no matter how far you are, your cone will not go drippy. *Ever heard of dripping dots*? The company in the United States makes its ice cream by raining their mixture in liquid nitrogen and there you have it ice cream chips. *Sounds fun right?*

In the evening we all crave a snack. To go with the serial or sports or just if you are bored and what's better than something fried?

Fried Foods

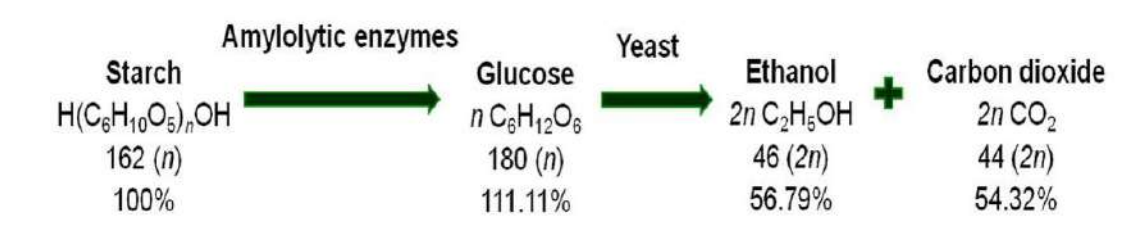
Cooking with chemistry is like an adventure with mystery involving kitchen stuffs. The most interesting laboratory is our kitchen to do experiment with delicious foods. There is a cool chemistry behind fried foods. Basically fried food is all about oil and is made by adding multiple layers of batter around the food.Flour or breadcrumbs may also be used. At first the surface of food being dehydrated, a crispy crust is formed. Then oil is absorbed by the crust and undergoes breakdown of proteins. It should be fried at higher temperature because proteins break down more easily at lower temperatures. That's because polyunsaturated fats have some weak carbon-hydrogen bonds, which break and set off a chain of chemical reactions that eventually produce volatile compounds. On Further heating it becomes crunchier. Fried foods first originated in Greece, where they were initially fried in olive oil. In 13th century deep fried food like funnel cake were popularized in Europe. There are lots of fried food all over the world like onion rings, doughnuts, French fries, jalebi,fried chicken, tempura spring roll- literally it's difficult to complete the list. *Just try it at home, make a crunchy, crispy, delicious bucket of French fries.*

Caution: Don't forget to treat a chemist with yummy foods

Chemistry was poor before the foundation of distilleries. Yes, now I got your attention. Its late night and you are full of fatigue or just an enthusiast, this drink will take you to the stars "ALCOHOL".

The simplest of chemical reactions (fermentation) has driven the world crazy since the rise of Rome. Though alcohol is not a drink, it's the principle compound of the globally consumed fermented liquor.

Ethanol or ethyl alcohol is produced when the yeast, saccharomyces cerevisiae eats through grape juice, barley, rice water or any other ingredient high in sugar content. In the reaction glucose breaks down to ethyl alcohol and carbon dioxide.



This reaction have seen people loosing war, loosing marriage, loosing life and even memories.

However for chemists like us alcohol is a solution, the drink however consists of 100s of other compounds. Irish or scotch- well that's for whiskey lovers, Guaiacol is the compound that gives whiskey its burnt smoky taste and aroma. The colour however comes from the oak barrels they are aged in. The price varies with the period over which it is aged. The taste is again vanilla coming from vanillin. There are impurities as well like isoamyl alcohol and propanol.

Are you Russian?Водка or the Russian holy water is a clear alcoholic drink made by fermenting potatoes. The reactions remains same but vodka has an immense burning sensation owing to its high alcohol percentage. The Russians like it simple but companies like Smirnoff and Absolute has revolutionized the drink globally by introducing flavored drinks like the all-time classic caramel, the watermelon, cherry, citrus, green apple and many more. The flavors mostly include compounds like citric acid, coumarin and limonene.These drinks contain glycerol as a smoothening agent- yes you heard it right Russians love it smooth!

Why travel the world when our country has been making liquor since the age of gods. India has the highest variety of indigenous alcoholic drink than any other. Say "*handia"* of Jharkhand, *"taari*" of Bengal, *"Apong*" of assam to *"thaati kallu*" of kerala, the list goes on with a regional traditional drink in every state, we are all intoxicated. India however manufactures the second highest selling rum in the world "*old monk*". The rum dates back to late 50s started from a single distillery. *So yes we love our "Jack Sparrow".*

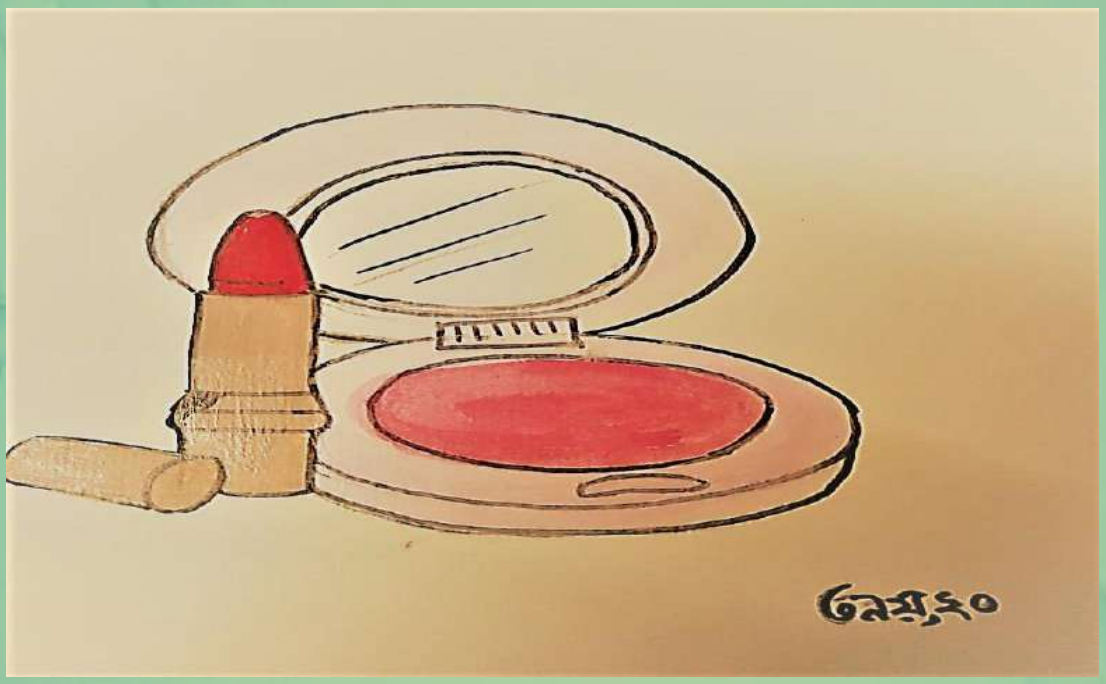
How does alcohol make us go tipsy? Ethanol after consumption undergoes oxidation in the stomach aerially and forms ethanal, an aldehyde and further oxidizes to ethanoic acid or acetic acid. This acid makes our tummy go ache by lowering the ph. The aldehyde formed is absorbed by blood and carried to every part of the body. Human coordination is maintained by synapses which allows neurons to transmit electrical signals throughout the body at a very high speed. The aldehyde formed now fits in the synapses and creates gaps in electrical transmission leading to delay in coordination which results in either swayed walking, slow speech even nausea and disability in decision making. *This is why it is dangerous to drink and drive.*

Being sober or tipsy is one's own choice but understanding how it works is fascination. *Chemistry is the most fascinating subject and you will get that even if you are drunk.*

Fun fact : Do you know , Excited oxygen is responsible for the bright red and yellow-green colors of the aurora.

THE CHEMISTRY OF BEAUTY

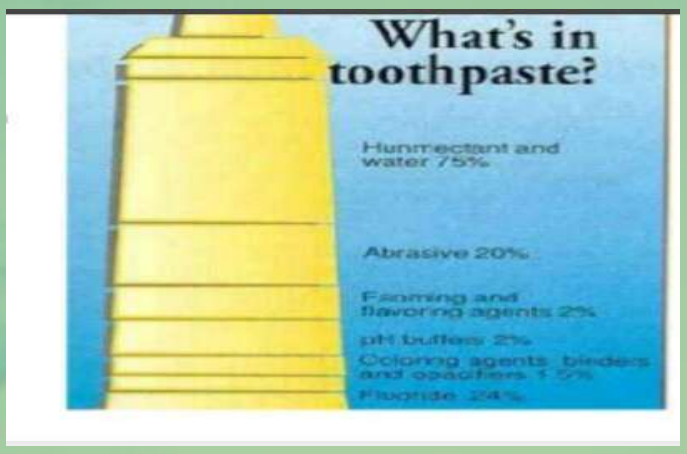
-Megha Bhowmick(3rd year)



-- --Drawing by Tanay Nag

Chemistry has large impact in different industry but in beauty industry? Yes you are correct it has large impact in beauty products. Cosmetics are the integral part of our life and chemicals are used in cosmetics in large scale. So now a days it is necessary to know about their function and toxicity in our body. So lets start with .....

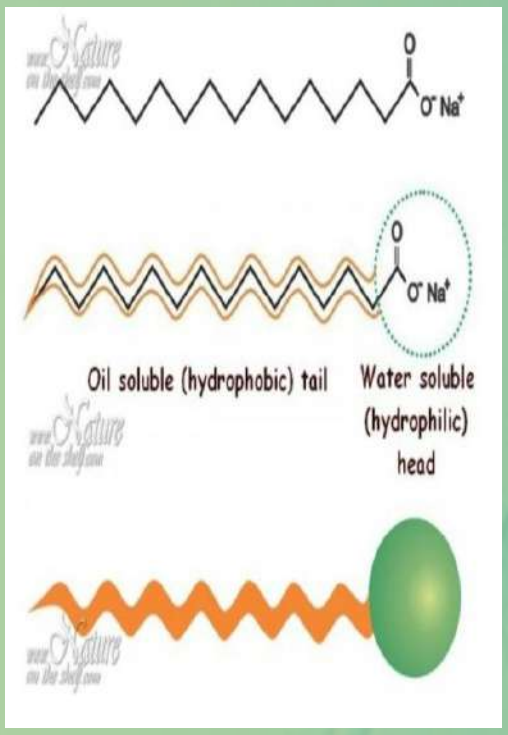
Toothpaste is one of the sanitary products that we used everyday.....morning and evening. Not only it helps to keep our teeth clean also prevent goggles from fogging. So let's describe the chemistry of toothpaste.



• Calcium carbonate	an abrasive used to remove plaque
• Sorbitol	prevents loss of water and hardening of toothpaste
• Glycerine	it helps to form foams in mouth
• Titanium dioxide	makes the toothpaste white
• Triclosan	an bacterial agent used to inhibit bacteria
• Methylsalicylate	give pleasant flavour of wintergreen

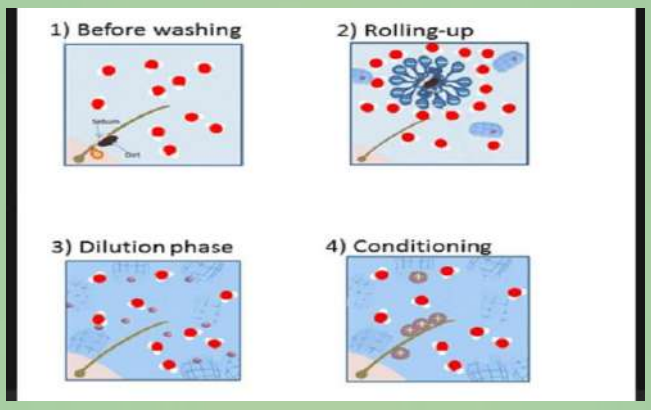
*Some studies reported that **Triclosan** can lead to gut inflammation and tumor growth in mammals*.

*Now the most essential thing is **soap**.....what is the chemistry behind soaps how do soaps perform the cleaning action ?*

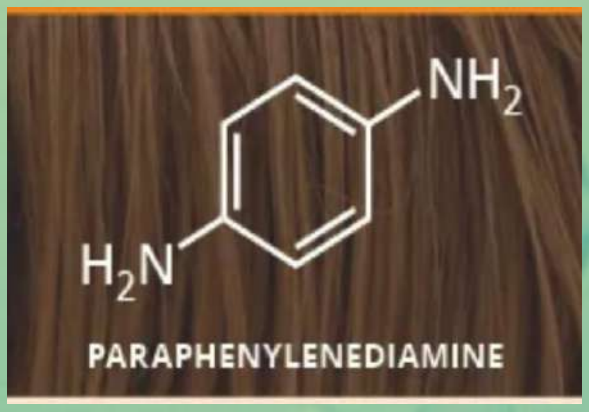


A **soap** is an organic substance, composed of the compounds carbon ,oxygen ,sulphur and hydrogen. All soaps contain vital cleaning agent called *surfactant* which attach themselves to the particle of dirt and lift them away . It's one part is hydrophilic and another part is hydrophobic. The hydrophobic tail of surfactant digs its way into the dirt , while another tail is drawn into the water. The surfactant increase the wetting ability of water by reducing its surface tension .

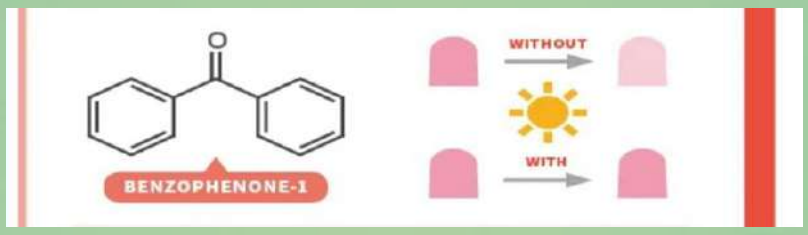
Shampoo is generally made by combining a surfactant, most often *sodium lauryl sulphate* with a co surfactant . The sulphate ingredients acts as a surfactant ,it help to tap oil and grease .The most common chemicals used in shampoo is *parabens*. The commonly used parabens are *methyl parabens , propyl parabens* and *ethyl paraben*. A number of studies show that methyl parabens may cause skin damage.



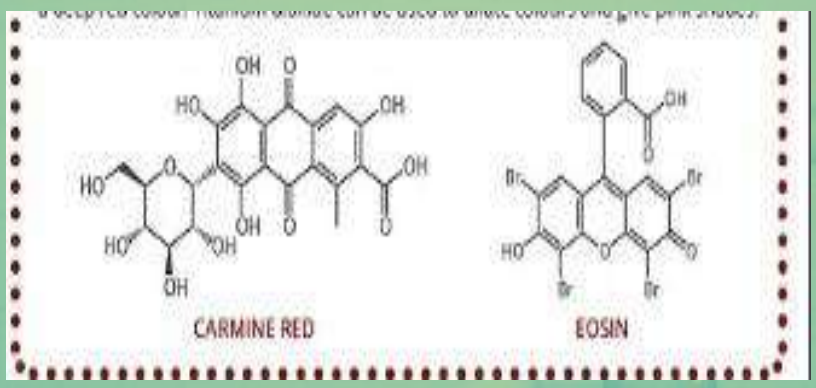
Hair dyes- hydrogen peroxide is used in hair dyes as an oxidiser, oxidising the natural melanin pigments of hair and causing them to lose their colour . It also aids the dyeing process by oxidising other chemicals in the dye mixture such as *paraphenylenediamine* to help produce the dye molecules that then colour the hair.



Nailpaint now comes the question of nail paint. *Ethyl acetate* and *butyl acetate* are commonly used as a solvent and give nail polish its characteristics smell .*Acetone* used as nailpolish remover . But we girls are not worried about chemicals our main concern is about nail paint colour and cracking and chipping . *Dibutyl phthalate* used as a plasticiser which prevemts cracking and chipping . Now a days it has been banned due to health concern. *Benzophenone-1* act as stabilizer and prevent the changing colour when exposed to sunlight.

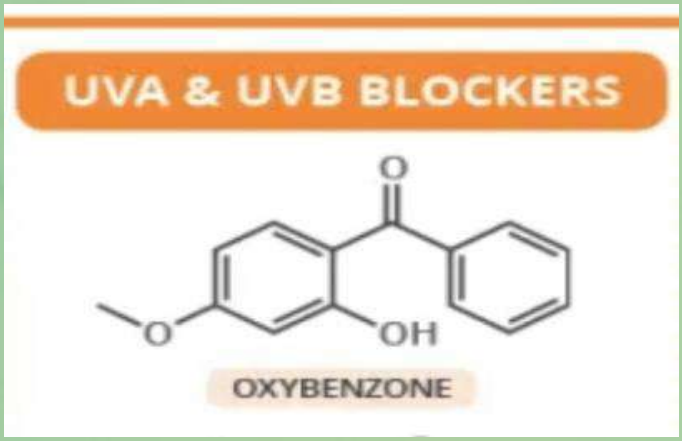


Lipsticks the most important things in the women`s bag is lipstick. There are too many shades are available . lipstick colour originates from a range of different pigments and dyes . *Carmine red* is a pigment derived from scale insects. Eosin also known as D and C red no 22 is a dye which reacts with the amino groups in the proteins of the skin to produce a dark red colour .*Titanium dioxide* can be used to dilute colour and give pink shades. Many natural wax are used . *Carnauba wax* has highest melting point and prevent lipstick from melting too easily. Waxes also give emollient properties and glossiness and also oils like castor oil make it glossy. Now a days most common is Matte lipstick. What is matt lipstick



Matte lipstick contain more wax and pigments and less oil which makes a drier texture. But the minerals oil used in lipstick may block the skin pores it contain lead which is harmful

Sunscreen it is widely used among us . This include inorganic pigments like *titanium dioxide* and organic compound like *oxybenzone , octocrylene* are used as a ingredients to protect our skin from uv ray but these can cause skin burn and skincancer .



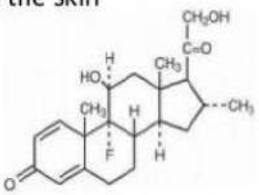
Now after use the cosmetics products we have to apply ***Make up Remover*** It contain water *cyclopentasiloxane, isohexadecane*, etc . water is the main solvent used in make up remover . the remover capable of breaking the interaction between makeup and skin and maintain the makeup dissolve

Beauty industry is not bound only among women but it is widely popular among men like ***Shaving cream*** ..... the ingredients are minerals *oil,glycols, phthalates, formaldehyde* etc. Shaving cream creates a thin layer between the blade and the skin , ensuring less friction and minimizing the risk of redness, razor burn , and irritation and fewer nick and cuts. It is also toxic because the mineral oil block the skin pore .

After shave often contains an anticeptic agent such as denatured alcohol , *stearate citrate* to prevent infection of cuts as well as to act as an astringent to reduce skin irritation.

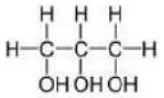
- Lanolin and polyoxyethylene sorbitan monostearate are both emulsifiers which hold water to the skin

Lanolin



- Glycerin, a solvent and an emollient, renders skin softer and more supple.

Glycerine



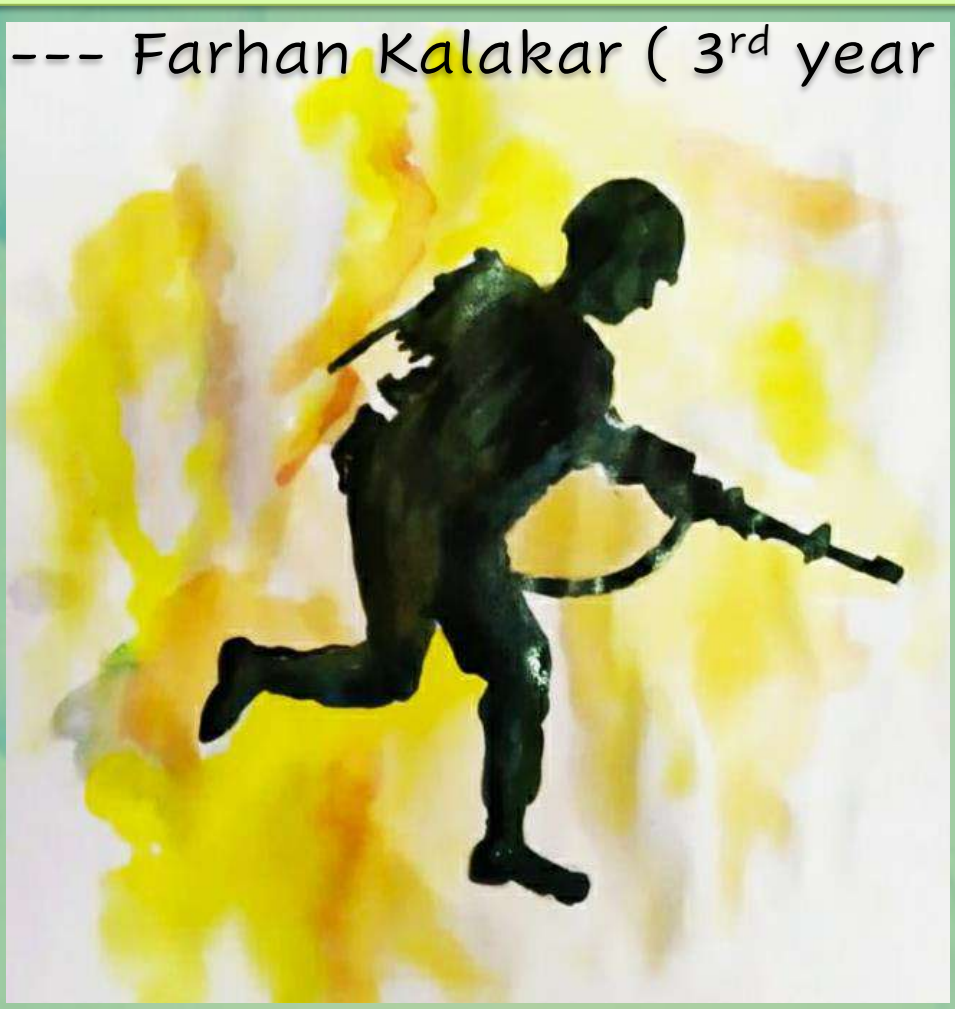
So from the above description , one can easily draw conclusions regarding the safety of a cosmetic products. Although the chemicals in cosmetics products are intented to improve skin ,lips and lashes, some can cause adverse effect such as acne, wrinkles even skin cancer miscarriage for pregnant women . Hence it is not recommended to use cosmetics too regularly.

****

Fun fact : Do you know , in France it is legal to marry a dead person .

FROM A LETHAL CHEMICAL WARFARE REAGENT TO AN ANTI-CANCER DRUG

--- Farhan Kalakar (3rd year)

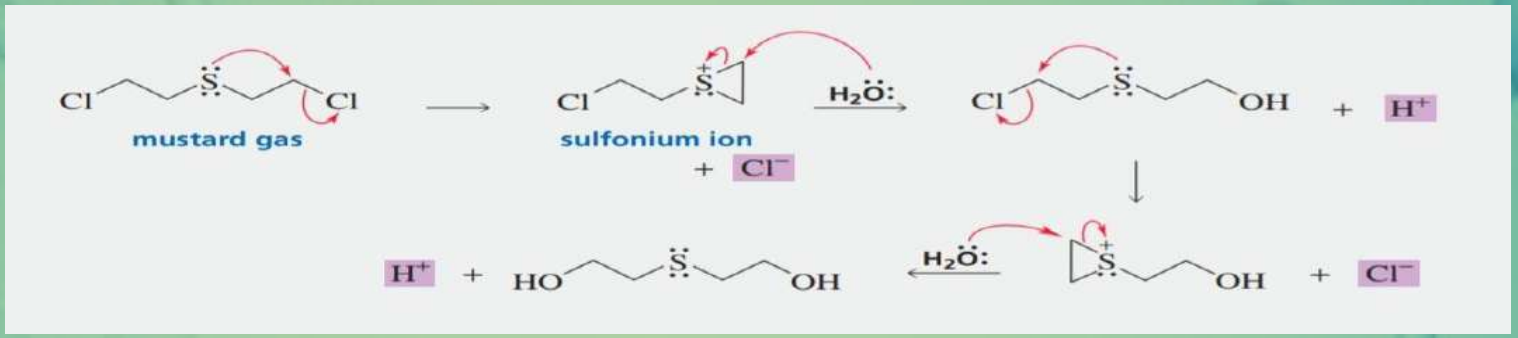


-drawing by Arup Biswas(5th Sem)

*Chemical warfare occurred for the first time in1915, when Germany released chlorine gas against French and British forces in the battle of **Ypers**. For the reminder of World War-1, both sides used a variety of chemical agents as weapons. One of the more common was mustard gas, agent that produces large blisters on exposed skin.*

•> Mustard gas is extremely reactive because it's highly nucleophilic sulphur atom easily displaces a chloride ion by an intramolecular SN2 reaction, forming a cyclic sulfonium ion that reacts rapidly with a nucleophile.The sulfonium salt is particularly reactive because of its strained three-membered ring and the excellent(positively charged) leaving group.

The blistering caused by mastard gas results the high local concentration of HCl when masteard gas comes into contact with water or any other nucleophile on the surface of the skin or lung tissues majorly damaging & hence causing skin and lugh cancers respectively.



Autopsies of soldiers killed by mastard gas in World War-1 revealed that they had extremely low white blood counts and defects in bone marrow development, indicating profound effects on rapidly dividing cells.

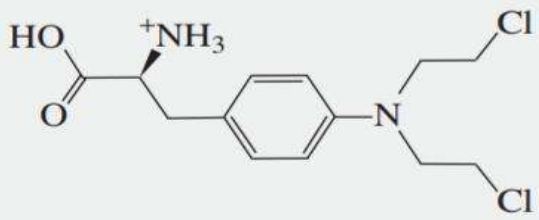
***H**owever*, being such an enormous awful aspect of this poisonous gas, chemists of that decade were practically able to resolve the major outcome of this as an anti cancer drug. Now, a big question comes in our mind is **"HOW?".**

We all know that Cancer which has really not been answered till 2020 but still trying the best by the Scientists of various aspects everyday.

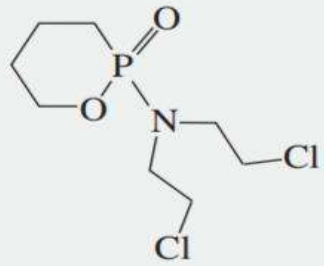
Now let me explain first with my small knowledge about CANCER!..

The name cancer is characterized by the uncontrolled growth and proliferation of cells. The discovery that mastard gas affected rapidly dividing cells suggested that it might be an effective antitumor agent whenever being alkylated. Therefore, chemists started looking for less reactive mustard gas that might be used in chemotherapy~that is, via in this way A Chemical Warefare Agent can be the Antidote!..

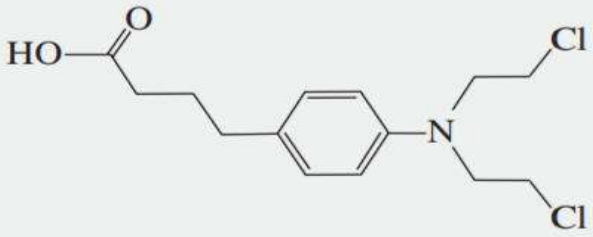
•> **How the Antidote Works?..Yes,** *If we closely look at the mechanism, mustard gas forms a three-membered ring that can react rapidly with nucleophiles, its clinical reactivity as thought to be due its ability to alkylate groups on the surface of DNA. Alkylating DNA can destroy it, which means that the rapidly growing cells of cancerous tumors are killed. Unfortunately, Compounds used for chemotherapy can also kill normal cells. That is why many side effects such as nausea and hair loss, ate associated with cancer therapy. The challenge for chemists now is go find drugs that will target only cancer cells.*



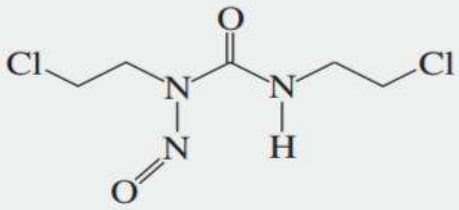
melphalan



cyclophosphamide



chloroambucil



carmustine

•><u>**Note**</u>: The Cancer drugs shown here are all biological alkylating agents~they attach an alkyl group to a nucleophile under physiological conditions and hence are eco-friendly to the human system.

#Reference:

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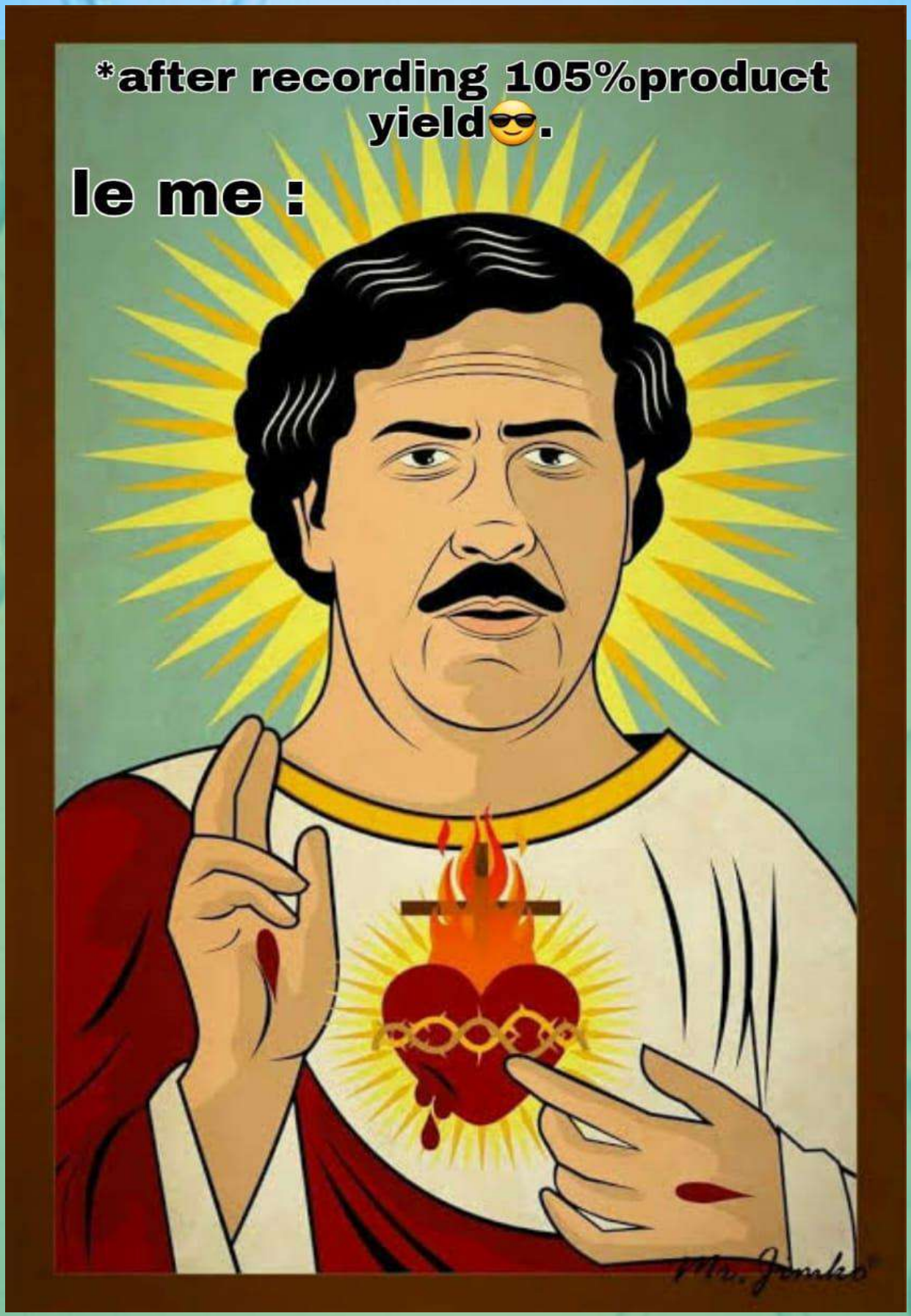
Copyright©2014,Pearson Education.

2. Organic Chemistry, 2nd edition, Jonathan Clayden, Nick Greeves, Stuart Warren.

3. Eisenmenger W.Drasch G.Von Clarmann M.Kretschmer E.Roider G.Clinical and morphological findings on mustard gas [bis(2-chloroethyl)sulfide] poisoning J.ForensicSci.1991;36:1688-1698.

Fun fact : Do you know , For the film Half Ticket, legendary singer Kishore Kumar sang both in male and female voices in the song, Aake Seedhi Lagi Dil Pe.



Edited by Sayantan Chakraborty

IRONMAN: THE BIOLOGICAL SUPERHERO

---- Sunando Santra

Iron is an essential element for blood production. About 70 percent of your body's iron is found in the red blood cells of your blood called hemoglobin and in muscle cells called myoglobin. Hemoglobin is essential for transferring oxygen in your blood from the lungs to the tissues. Myoglobin, in muscle cells, accepts, stores, transports and releases oxygen.

About 6 percent of body iron is a component of certain proteins, essential for respiration and energy metabolism, and as a component of enzymes involved in the synthesis of collagen and some neurotransmitters. Iron also is needed for proper immune function.

About 25 percent of the iron in the body is stored as ferritin, found in cells and circulates in the blood. The average adult male has about 1,000 mg of stored iron (enough for about three years), whereas women on average have only about 300 mg (enough for about six months). When iron intake is chronically low, stores can become depleted, decreasing hemoglobin levels.

When iron stores are exhausted, the condition is called iron depletion. Further decreases may be called iron-deficient erythropoiesis and still further decreases produce iron deficiency anemia.

Blood loss is the most common cause of iron deficiency. In men and postmenopausal women, iron deficiency is almost always the result of gastrointestinal blood loss. In menstruating women, genitourinary blood loss often accounts for increased iron requirements. Oral contraceptives tend to decrease menstrual blood loss, whereas intrauterine devices tend to increase menstrual bleeding. Other causes of genitourinary bleeding and respiratory tract bleeding also increase iron requirements.

For blood donors, each donation results in the loss of 200 to 250 mg of iron. During periods of growth in infancy, childhood and adolescence, iron requirements may outstrip the supply of iron from diet and stores. Iron loss from tissue growth during pregnancy and from bleeding during delivery and post-partum averages 740 mg. Breastfeeding increases iron requirements by about 0.5 to 1 mg a day.

Iron helps oxygenate the blood

The key function of iron is to facilitate oxygen transport by hemoglobin, the oxygen-carrying pigment of the erythrocytes (red blood cells)[1]. It is also involved in oxygen storage by myoglobin, an iron-containing protein that transports and stores oxygen within muscle and releases it to meet increased metabolic demands during muscle contraction

Iron helps convert blood sugar to energy

Our bodies need iron to convert blood sugar to energy. It helps boost hemoglobin production and thus increases the transport of oxygen to help alleviate fatigue and tiredness. Also, the creation of enzymes (which play a vital role in the production of new cells, amino acids, hormones and neurotransmitters) also depends on iron. Whether you're an Olympic athlete or a regular person with a 9-5 desk job, your body needs iron to perform at its physical and mental best.

Iron boosts the immune system

Iron is vital for the proliferation of all cells including those of the immune system. Having an adequate amount of iron in your system will help your immune system to function helping you to support and maintain good health

Iron aids cognitive function

Iron deficiency can contribute to impaired cognitive function[2].

Iron supports healthy skin, hair and nails

Iron supports enzyme systems that are involved in the synthesis of collagen and elastin. It helps the hair to become vibrant and shiny and it also helps prevent the nails from becoming brittle and dry by keeping them strong and moist.

Our bodies don't produce iron by themselves and also lose it through a number of ways including menstruation, urination, defecation, sweat and the exfoliation of dead skin cells. Iron deficiency is the most common nutritional deficiency in the world. This means we need to consume sufficient amounts of it as part of a healthy balanced diet.

What is the role of iron?

Iron plays an important role in the body. One of the main roles of iron is to help our red blood cells transport oxygen to all parts of the body.

Non-Haem Iron: This type of iron is found in plant-based foods like cereals, vegetables and legumes. In contrast to haem iron, our body doesn't absorb non-haem iron as easily. However, because it is present in the diet in much larger quantities than is haem iron, it is an important source of this mineral. We generally obtain around 65% of our iron requirements from non-haem iron

HUMAN REQUIREMENTS

During early infancy, iron requirements are met by the little iron contained in the human milk. The need for iron rises markedly 4-6 months after birth and amounts to about 0.7-0.9 mg/day during the remaining part of the first year. Between 1 and 6 years of age, the body iron content is again doubled. Iron requirements are also very high in adolescents, particularly during the period of growth spurt. Girls usually have their growth spurt before menarche, but growth is not finished at that time. In boys there is a marked increase in hemoglobin mass and concentration during puberty. In this stage, iron requirements increase to a level above the average iron requirements in menstruating women

Iron requirements of 97.5% of individuals in terms of absorbed iron[a], by age group and sex (World Health Organization, 1989)

Age/sex	mg/day[b]
4–12 months	0.96
13–24 months	0.61
2–5 years	0.70
6–11 years	1.17
12–16 years (girls)	2.02
12–16 years (boys)	1.82
Adult males	
Pregnant women[c]	1.14
First trimester	0.8
Second and third trimester	6.3
Lactating women	1.31
Menstruating women	2.38
Postmenopausal women	0.96

[a] Absorbed iron is the fraction that passes from the gastrointestinal tract into the body for further use. [b] Calculated on the basis of median weight for age. [c] Requirements during pregnancy depend on the woman's iron status prior to pregnancy

CONSEQUENCES AND CAUSES OF IRON DEFICIENCY

Consequences of iron deficiency

Iron deficiency is defined as a condition in which there are no mobilizable iron stores and in which signs of a compromised supply of iron to tissues, including the erythron, are noted. Iron deficiency can exist with or without anemia. Some functional changes may occur in the absence of anemia, but the most functional deficits appear to occur with the development of anemia. Even mild and moderate forms of iron deficiency anemia can be associated with functional impairments affecting cognitive development, immunity mechanisms, and work capacity. Iron deficiency during pregnancy is associated with a variety of adverse outcomes for both mother and infant, including increased risk of sepsis, maternal mortality, perinatal mortality, and low birth weight. Iron deficiency and anemia also reduce learning ability and are associated with increased rates of morbidity.

Causes of iron deficiency

Iron deficiency results from depletion of iron stores and occurs when iron absorption cannot keep pace over an extended period with the metabolic demands for iron to sustain growth and to replenish iron loss, which is primarily related to blood loss. The primary causes of iron deficiency include low intake of bioavailable iron, increased iron requirements as a result of rapid growth, pregnancy, menstruation, and excess blood loss caused by pathologic infections, such as hook worm and whipworm causing gastrointestinal blood loss and impaired absorption of iron.

The frequency of iron deficiency rises in female adolescents because menstrual iron losses are superimposed with needs for rapid growth. Other risk factors for iron deficiency in young women are high parity, use of an intrauterine device, and vegetarian diets.

Nutritional iron deficiency arises when physiological requirements cannot be met by iron absorption from the diet. Dietary iron bioavailability is low in populations consuming monotonous plant-based diets with little meat. In many developing countries, plant-based weaning-foods are rarely fortified with iron, and the frequency of anemia exceeds 50% in children younger than 4 years.

When iron stores are depleted and insufficient iron is available for erythropoiesis, hemoglobin synthesis in erythrocyte precursors become impaired and hematologic signs of iron deficiency anemia appear.

Iron deficiency anemia

The most significant and common cause of anemia is iron deficiency. If iron intake is limited or inadequate due to poor dietary intake, anemia may occur as a result. This is called iron deficiency anemia. Iron deficiency anemia can also occur when there are stomach ulcers or other sources of slow, chronic bleeding (colon cancer, uterine cancer, intestinal polyps, hemorrhoids, etc).

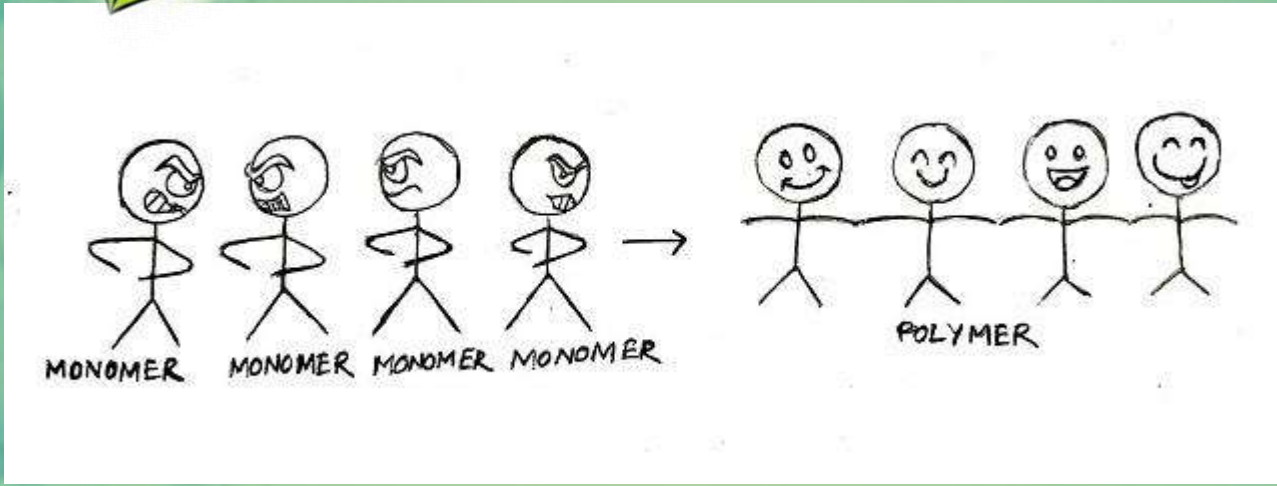
Fun fact : Do you know , Canadians say "sorry" so much that a law was passed in 2009 declaring that an apology can't be used as evidence of admission to guilt.

Boron ,
Aluminium ,
Gallium ,
Indium ,
Thallium .

Begun ,
Alu ,
Gajor ,
In
Thala .

Eco-friendly polymer

---- Bikramjit Maity



-drawing by ARUP BISWAS(5TH Sem)

Have you ever wonder while eating a capsule covered with plastic like substance? *Don't panic, the plastic like cover of capsules is not really plastic. It is a biodegradable and water dissolving polymer. After taking those pills, the covering is dissolved in body and the main substance inside it becomes absorbable.*

We are actually surrounded everywhere by polymers. From the small polythene bags we use to the large shari, Indian women used to wear, are examples of polymer. But unfortunately most of them are non-biodegradable. Nowadays polymer became an essential part of human life. So we need to invent or use more environment friendly polymer*. Let's start a journey to know more about this essential topic and to start thinking in a different way, to save the environment.*

A polymer is a substance or material consisting of very large molecules, or macromolecules of repeatingsubunits. Due to their board spectrum of properties, both synthetic and natural polymers play essential and ubiquitous roles in everydaylife.

Environmental friendly polymer are defined as materials whose chemical and physical characteristics undergo deterioration and completely degrade when exposed to microorganisms, aerobic and anaerobic processes. A various type of Eco friendly polymer is present in the world .The materials develop it like starch, cellulose and Polyesters. The common example of aliphatic biodegradable polymers are *poly glycolic acid (PGA),polyhydroxybutyrate,polyhydroxy butyrate -co-beta hydroxyvalerate, PCL, Nylon -2nylon-6.*

Eco friendly polymer is very helpful in our life. An increasing number of applications have emerged recently (including packaging biomedical products , textiles , agriculture , house hold use and building) where biodegradable polymers are particularly suitable as sustainable alternatives .The development of a multi- layered bio composite based on expanded starch reinforced by natural fibers for food packaging applications . Also the developmentof mulching and silage films based on proteins extracted from cotton seeds for agricultural applications. Also Eco friendly polymer is applicable of a bio composite for automobile applications associating poly lactic acid

Based materials and alterable glass fibres .The formulation of poly lactic acid -based blowing films for textile applications, such as disposable safety work wear and the processing of poly lactic acid based from products for several industrial sectors such as packaging and transport. Bio-composites where the successive transformation process from the raw materials to the final products are environmental friendly.

Agro polymers include starch -based and protein based polymers. Starch is the main storage supply in botanical sources such as cereals (wheat,maize,rice....),tubers (potato...) and legumes (pea...) from biotechnology (conventional synthesis from bio-derived monomers) such as poly lactides (PLA). By extraction from microorganisms such as poly-hydroxyalkanoates (PHA) and petrochemical synthesis from synthesis monomers) such as poly caprolactone (PCL) and aromatic and aliphatic co polyesters.

Alterable glass fibre is aneco-friendly polymer.It developed in recent years have been used in medical applications. They are based on silicate,calcium and phosphate components , leading to an improvement in microorganism activity .

Also PLA is a biodegradable polymer. Poly-hydroxyalkanoates is aliphatic polyester. PCL is widely used as a PVC solid plasticizer or for polyurethane applications

Nylon-2-Nylon-6 is an eco-friendly polymer. It is used in making ropes and parachutes and artificial fibres. The progress made in the field of environmental friendly biodegradable polymers and composites over the past ten years has been impressive. A large number of companies are involved in this area, producing a wide range of products. There are also major ongoing advances in research and development contributing to the increased attractiveness of chemical sciences and technology for a new generation of scientists and engineers. Their relatively high production and processing costs , and the need to minimize the use of agricultural land and forests,thereby also avoiding competition with food production and adverse effects on biodiversity and other environmental impacts .

Remember, where we started this journey? Yes! From the small covering of capsule. Now we have discussed environment friendly polymer in brief. And you, my dear friend who have gone through this wonderful journey with me, can easily conclude that there are numerous polymer, which surrounds us. That maybe a small capsule

Covering or maybe a giant electronic frame. Thank you, once again to stay with me throughout this journey. Now I started to feel that we can change the world for a better tomorrow by using more environment friendly polymer. This may not happen in one day. But I am sure that, we can do that in near future. *And with this essence of hope to change the world for a better tomorrow , let's end this wonderful journey by reciting some lines from the poem 'Stopping by Woods on a Snowy Evening' by Robert Frost ,*

"The woods are lovely, dark and deep,

But I have promises to keep,

And miles to go before I sleep,

And miles to go before I sleep. " ----------

Fun fact : Do you know , leaving a party without telling anyone is called in English, a "French Exit". In French, it's called a "partir à l'anglaise", to leave like the English.

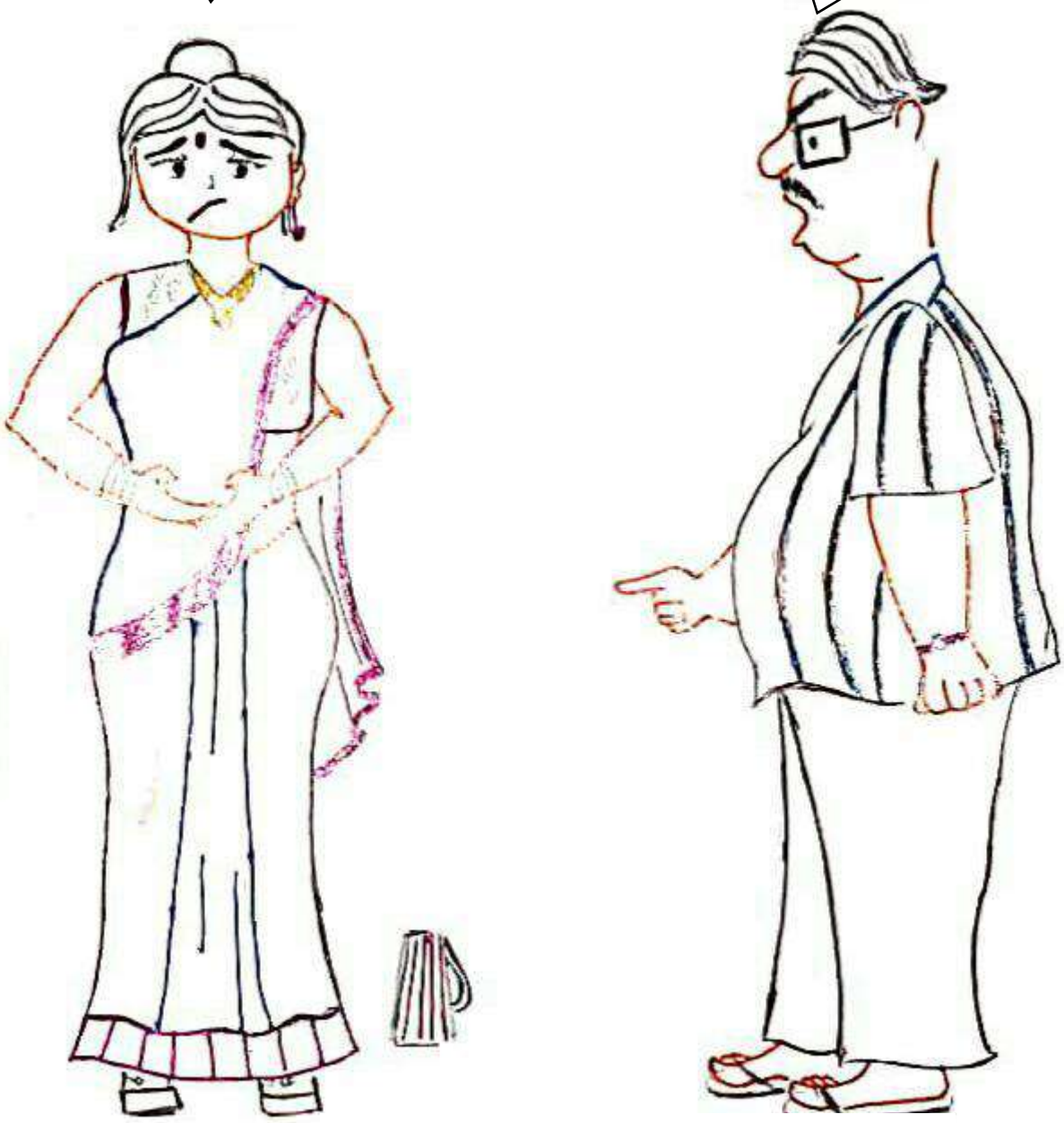
এই দেখো পুজোয় এই শাড়িটা নিলাম । কেমন লাগছে আমায় বললে না তো ? দোকানের সেরা শাড়ি এটা ।

Hmm Nylon দেখছি। Synthetic polymer made with monomers- 1,6-diaminohexane and hexane-1,6-dicarboxylic acid

Drawing by --- Monoj Ghosh (4th semester)

উফ! আর পারিনা। একটা শাড়ি ,তারও ঠিকুজি উদ্ধার করে দিলেন chemistry ঝেড়ে!

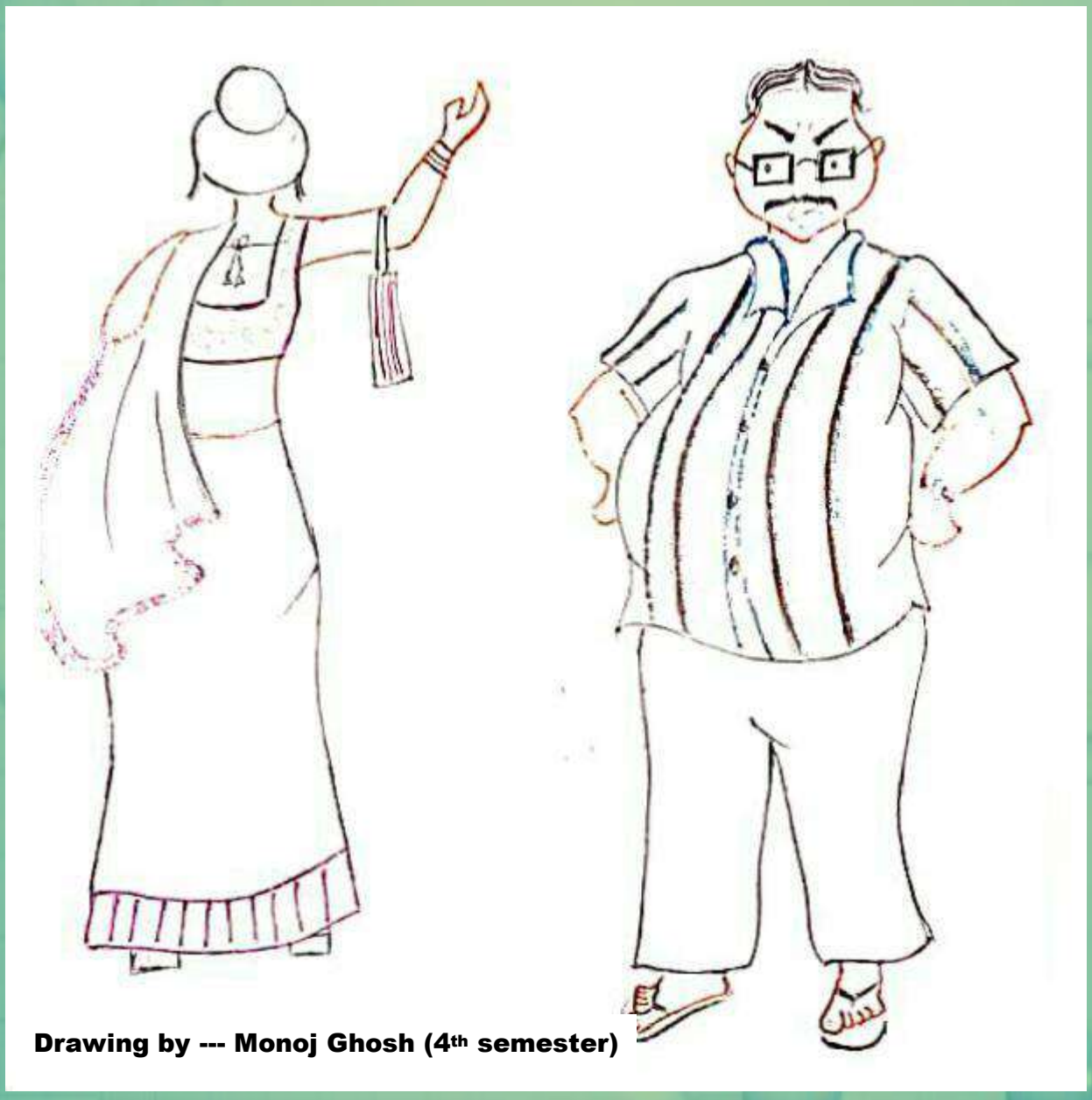
তাছাড়াও জেনে রাখা দরকার It is formed by ring-opening opening polymerization,a special case in comparison between condensation and additon polymers



Drawing by --- Monoj Ghosh (4th semester)

ঠিক আছে তুমি বরং তোমার chemistryর বুলি আওড়াও ,আমি চললাম বাপের বাড়ি।

যা বাবা! আমি কি করলাম? Polymer কে তো polymer ই বলবো নাকি? সে শাড়ি হোক বা জামা।



Drawing by --- Monoj Ghosh (4th semester)

নাটক - যুদ্ধের অবসানে সৃষ্ট রসায়ন

------ RAMESWAR CHAKRABORTY

'রসায়ন'- কথাটির মধ্যেই যেন রস রস ভাব,যা পরিবেশের প্রতিটি বিষয়ের সাথেই যুক্ত। এমনকি!জীবেরা তাদের প্রেম-ভালোবাসার মাঝেও রসায়নকে উপলব্ধি করে।এটি বিজ্ঞানের এমন একটি শাখা যেখানে কোনো কিছুর শেষ নতুন সৃষ্টির রূপ নিতে পারে।কিছু মানুষ তাদের জীবনে অসফলতাকে মেনে নিতে না পেরে-এটাকে হারের রূপ দিয়ে ভাগ্যের ওপর ছেড়ে দেয়,যা রসায়নের দৃষ্টিভঙ্গিতে একেবারেই অর্থহীন। রসায়নে এমন বহু দৃষ্টান্ত আছে,যেখানে বিজ্ঞানীরা তাদের প্রাথমিক অসফলতাকে মনের জোর দিয়ে কাজে লাগিয়ে-বিজ্ঞানপ্রসারে এক নতুন আলো দেখিয়েছেন।আবার,দুদেশের মধ্যে অন্তর্দন্ধও রসায়ন বিস্তারের এক উল্লেখযোগ্য দৃষ্টান্ত।সে-রকমই এক দৃষ্টান্তকে নাট্যসাহিত্যের মাধ্যমে প্রকাশ এক ক্ষুদ্র প্রয়াস মাত্র।

চলুন যাওয়া যাক সেই 1863 সালে,যেসময় হয়েছিল এক রসায়ন যুদ্ধ। যাকে বিজ্ঞানের ভাষায় এক স্নায়ুযুদ্ধও বলা চলে।

আদি:- (বিখ্যাত আমেরিকান বিজ্ঞানীর বিকার হাতে প্রবেশ) না:,পাচ্ছিনা।কতক্ষন ধরে ে করছি-কিছুই নতুন পাচ্ছিনা।এদিকে বাজারে নামটাও একেবারে তলানিতে,কিছু তো একটা করতেই হবে! (কিছুক্ষন পর হঠাৎ...) পেয়েছি....আমি পেয়েছি,এবার দেখি-কোন বিজ্ঞানী আমার থেকে আগে থাকে। যায়, গিয়ে সানুকে খবরটা দিই।

সানু:- (সায়েন্স কমিউনিটির সভাপতি,সকালের নিত্যকর্ম সারছিলেন। হঠাৎ, দরজায় সানু-সানু চিৎকার শুনে অবাক...)

(দরজা খুলে) আরে আদি তুই!এত সকালে হঠাৎ! আয়, ভেতরে আয়।

আদি:- আরে....আমি একটা দারুন মলিকিউল এর সন্ধান পেয়েছি,তাইতো দেরি না করে চলে এলাম।

সানু:-আরে বাঃ, দারুন! তা কই দেখি?

আদি:- (কাগজ বের করে) CH3(CO)CH2(COOEt) এই দ্যাখ।

সানু:- (কিছুক্ষন দেখে) বাঃ, দারুন দেখতে তো!তা এর নাম কি?

আদি:- (উৎকণ্ঠিত হয়ে) ইথাইল আসিটোআসিটেট।

সানু:- (অবাক দৃষ্টিতে) মানে!এটা- কি করে সম্ভব?

আদি:- (নিম্নস্বরে) কেন নয়?

সানু:- এই নামের অন্য একটি মলিকিউল কালকেই এসেছে আমার কাছে,জার্মানী থেকে।

আদি:- (সামান্য রেগে) কি? কার এত বড় সাহস যে-আমার দেওয়া নাম চুরি করে।

সানু:- ওর নাম জগা, ও-জার্মানীর এক বিখ্যাত বিজ্ঞানী।

আদি:- (আরও রেগে গিয়ে) নামকরা না ছাই, সব চোরের দল।একবার শালাকে কাছে পেলে,চুরির ফল কী-তা দেখিয়ে দিতাম।

সানু:- আরে শান্ত হ, তাছাড়া ওকে দোষ দিয়েও তো কোনো লাভ নেই। ওতো-তোর আগেই মলিকিউলটা জমা দিয়েছে।

আদি:- মানে!তুই কী বলছিস,আমাদের আমেরিকার কাছে ওই জার্মানী। নির্ঘাত কালকে আমার পেটটা খারাপ হয়েছিল,না হলে আমিই তো আগে জমা দিতাম।

সানু:- (শান্তভাবে) আচ্ছা বাবা-আচ্ছা..,তুই আজ বাড়ি যা।আমি একদিন সকলকে ডেকে এই সমস্যার সমাধান করব।

আদি:- ডাক শালাকে একবার।

(এইবলে আদি বাড়ির দিকে প্রস্থান করল)

সানু:- (বিড়বিড় করে) সত্যিই তো!ব্যাপারটা জানাজানি হলে,সায়েন্স কমিউনিটির নাম একেবারে ধুলোয় মিশে যাবে।নাঃ, আমাকেই কিছু করতে হবে।

(কিছুদিন পর সানু এক সভার আয়োজন করলেন,যেখানে সমস্যা সমাধানের জন্য এক শীর্ষকর্তার আবির্ভাব হয়েছিল।)

আদি:- (সানুর অফিসে এসে) সানু..আসবো?

সানু:- (উঠে দাঁড়িয়ে) আয়-আয়..

(উপস্থিত আরও দুজন আদিকে স্বাগত জানালো)

আদি:- **(বিড়বিড় করে)** বাবাঃ, এখানে দুজন আবার কে?একজন তো ওই চোর জার্মানী, তাহলে এই-ব্যাটা আবার কে?

(চতুর্থ ব্যাক্তির উপস্থিতি -আদির রাগকে কিছুটা প্রশমিত করল)

সানু:- এই দ্যাখ আদি,ইনি হলেন জার্মান বিজ্ঞানী জগা।আর ইনি হলেন আমাদেরই সিনিয়র - বিজ্ঞানী নাড়ু, এনার জন্ম আমেরিকায় কিন্তু কাজ করেন জার্মানীতে।

(আদির পরিচয় দুজনকে আগেই জানিয়েছিলেন সানু)

সানু:- **(পরিচয় শেষে)** আচ্ছা,তাহলে আমাদের সমস্যা সমাধানের জন্য দুটো মলিকিউলের গঠনকে পাশাপাশি **রাখা** হোক?

নাড়ু:- একদম..

আদি:- **(মনে মনে)**ওই চোরের পাশে আমি!

সানু:- CH3(CO)CH2(COOEt) & CH3-C(OH)=CH-COOEt (বোর্ডে লিখে দিল)

জগা:- আমি গ্যারান্টি দিয়ে বলতে পারি,যে আমার গঠনে কোনো ভুল নেই।

আদি:- **(আর সামলাতে না পেরে)** মানে!আমারটা কি ভুল তাহলে?

নাড়ু:- আরে থামুন-থামুন..,আপনারা উত্তেজিত হবেন না।

সানু:- আরে চুপকর তোরা।

নাড়ু:- (ভালোভাবে পর্যবেক্ষণ করে) এ-দুটো গঠনই ঠিক।

জগা:- মানে!..

আদি:- কী বলছেন কি আপনি?

জগা:- ও..! বুঝেছি, আপনার জন্ম আমেরিকায় বলে হয়তো- আমেরিকার হার আপনি মানতে পারছেননা না?

আদি:- হতেই পারে না,আপনি নিশ্চই আপনার কর্মস্থল রক্ষা করছেন।

নাড়ু:- (ঠান্ডা মাথায়) না,আমি ঠিকই বলছি।এই দুটো গঠন একই,এবং এরা একে-অপরের পরিবর্তিত রূপ।

আদি:- (চুপচাপ গালে হাত)

জগা:- মানে!

সানু:- এটা কি সম্ভব?

নাড়ু:- হ্যাঁ, এটা সম্ভব।(আরও ভালোভাবে বোঝানোর পর নাড়ু আদির বানানো গঠনের নাম দেন-'কিটো',এবং জগার বানানো গঠনের নাম দেন-'এনল'।

সানু:- (হাঁফ ছেড়ে) যাক বাবা বাঁচা গেল।কিরে জগা, কিরে আদি-হলতো তোদের সমস্যার সমাধান?

আদি:- (তখনও ভাবছে)

জগা:- দারুন তো!

(এইভাবে সর্বপ্রথম ইথাইল আসিটোআসিটেট গঠনের উৎপত্তি হয়,যা ছিল-দুদেশের বিজ্ঞানীদ্বয়ের এক স্নায়ুযুদ্ধের অবসান।এবং পরবর্তীকালে উপরিউক্ত দুটি গঠন থেকে বিজ্ঞানী নর(নাড়ু) এক নতুন ধারণার জন্ম দেন,যার নাম-'টোটোমেরিসিম'।)

---------**সমাপ্ত**--------

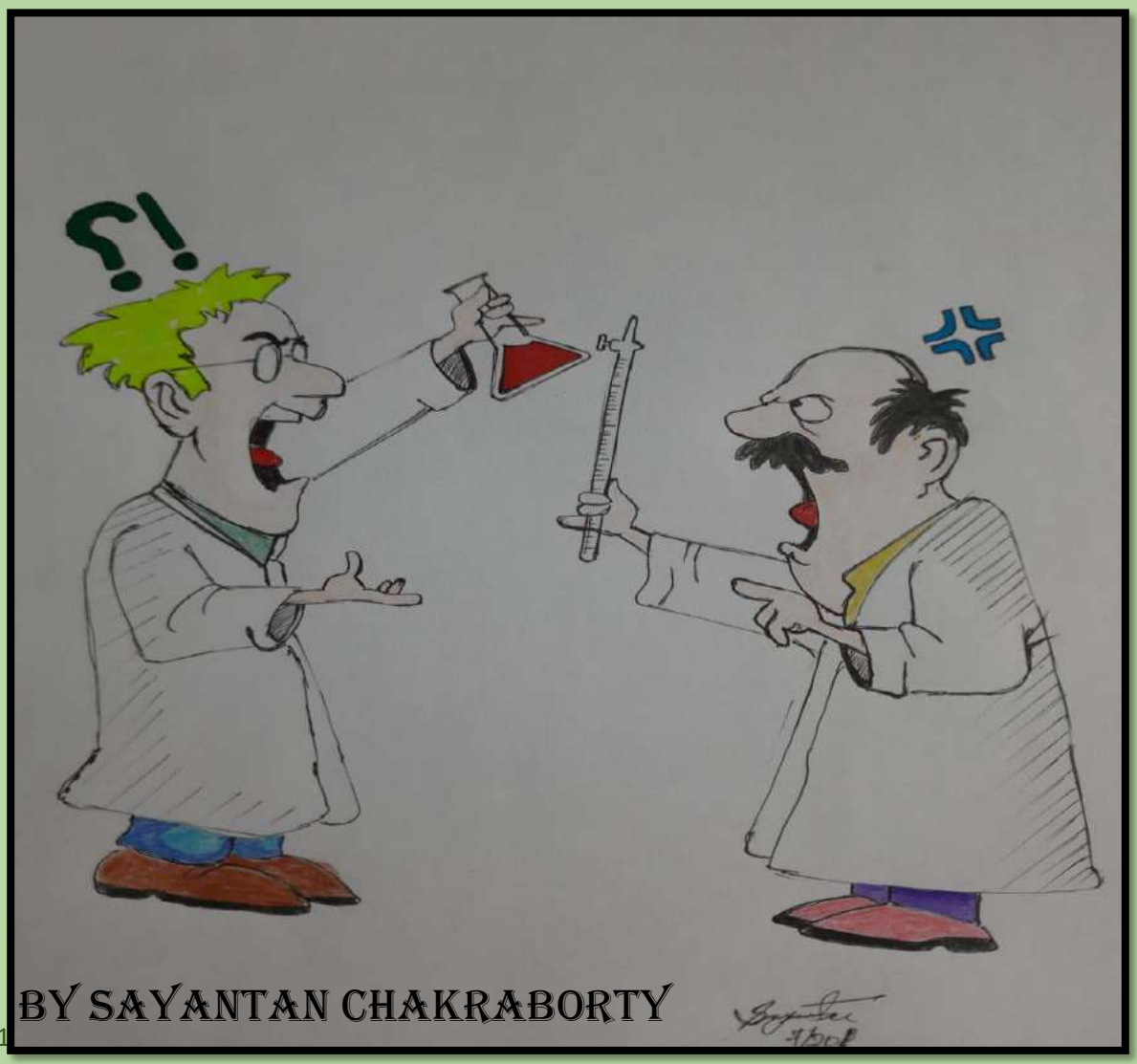
অভিনয়ে:-

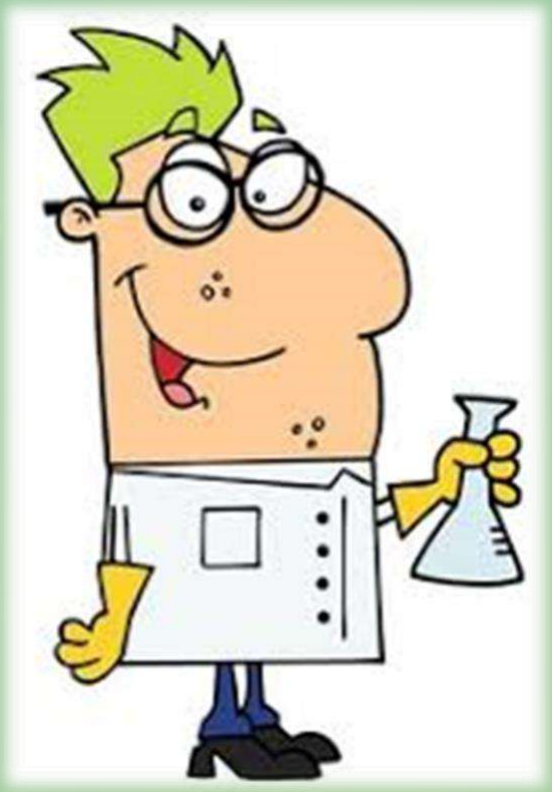
আদির চরিত্রে-আমেরিকান বিজ্ঞানী এডওয়ার্ড ফ্রাঙ্কলান্ড।

জগার চরিত্রে-জার্মান বিজ্ঞানী এন্টনি জিউথার।

সানুর চরিত্রে-ইন্টারন্যাশনাল সায়েন্স কমিউনিটির সভাপতি।

নাড়ুর চরিত্রে-বিজ্ঞানী নর।জন্ম-আমেরিকা,কর্মস্থল-জার্মানী।

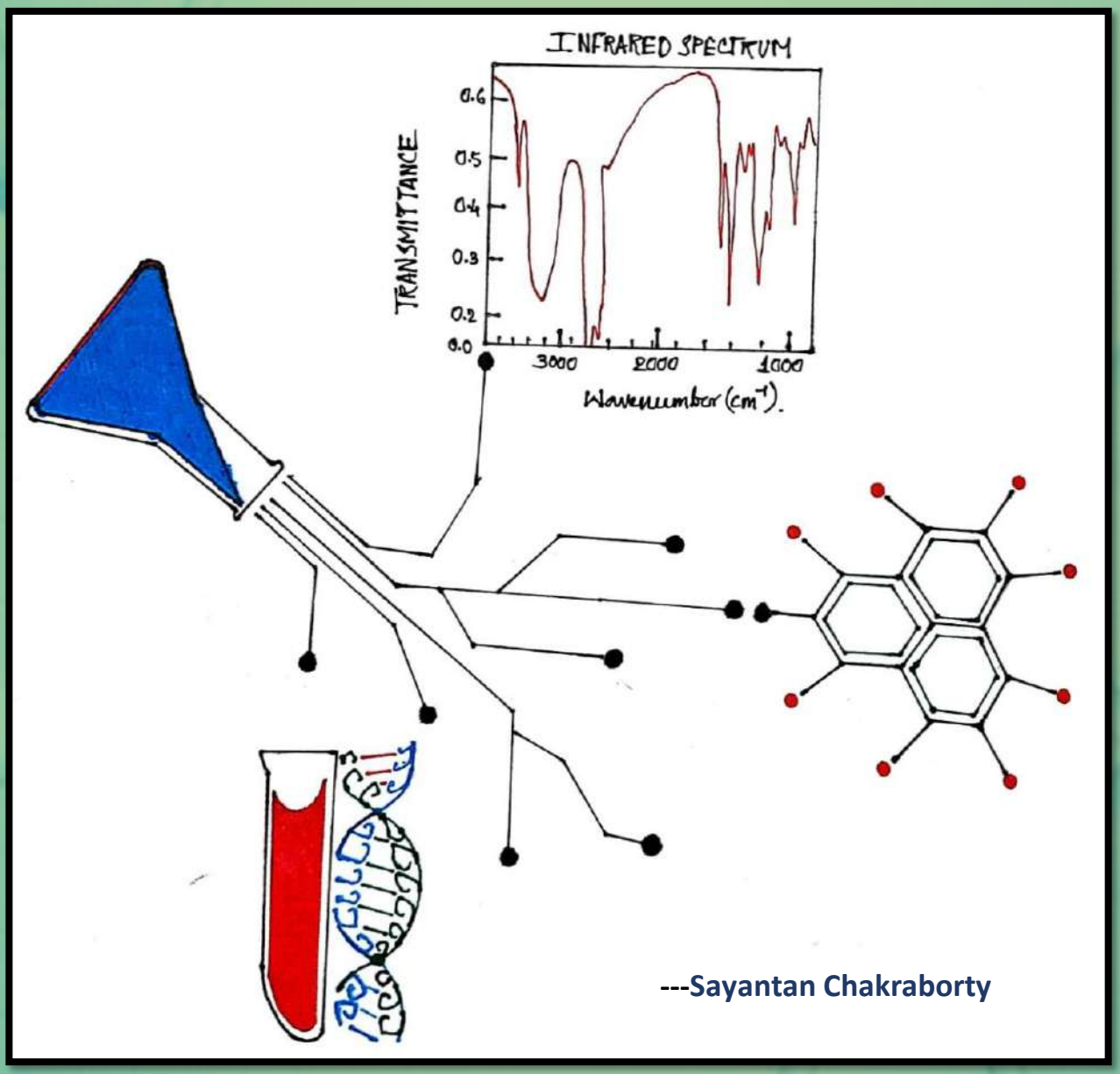




Fun fact : Do you know , Mars is red because its surface contains a lot of iron oxide or rust.

THE NEW FUTURE: WHEN A.I. MEETS CHEMISTRY

---------- *Swarup Das*



---Sayantan Chakraborty

***Artificial intelligence* (AI)** *is known as computer intelligence or machine intelligence which means machines that are superior to humans in every possible ways. Back in the 1950s, AI is first discovered. AI systems will typically demonstrate some of the behaviours associated with human intelligence like planning,learning,problem solving, etc.*

At a very high level artificial intelligence is splitted into two types: ***narrow AI*** *and* ***artificial general intelligence(AGI).***

Artificial intelligence is not a future, AI is already here. Nowadays, AI is being used more and more by chemists to perform various tasks. Research in AI applied to chemistry has largely been fueled by the need to accelerate drug discovery and reduce its huge costs and the time to market the new drugs. However the applications of AI in chemistry are not limited to drug discovery.

Artificial intelligence can also predict molecular properties accurately. Methods of prediction of molecular properties are Quantitative Structure Activity Relationships(QSAR) and Quantitative Structure Property Relationships(QSPR) for a long time.Today machine learning algorithms have been used to predict molecular properties like solubility, melting pt. , bioactivity, toxicity, atomization energy, HOMO/LUMO energies etc.The infos. from machine intelligence are entirely data-driven; they are not based on physical laws.AI can be used in combination with other prediction methods to predict properties more accurately than humans.

In the case of Molecular Designing, chemists uses their knowledge and creativity to propose new molecular structures but there is some limitations such as 'Human creativity' is biased and human mind are not capable of designing large sets of new molecules in a reasonable time.Here A.I. plays the pivotal role to the human creativity for designing molecular structures. It can generate huge number of molecules in very short time.We can convert our known molecules to new similar molecules by the help of AI and also the new designed molecules can either be synthesized or used for virtual screening by AI based software

Today artificial intelligence has emerged as a valuable complement to the scientists for Retrosynthesis analysis,recently,several high performance machine learning based algorithms have been developed to assist chemists doing retrosynthesis. These algorithms has been trained on very large number of organic reations but there are some limitations on these AI based tools which can be solved in future by the help of science and technology .However, these AI based retrosynthetic tools are already very valuable for organic chemistry.Some of the chemists said AI will bring revolution in organic chemistry in future.

Artificial intelligence can also help to predict the reaction outcomes as well as the conditions involved in that particular reactions. These predictions fully based on the datas of millions of organic reactions.It can also optimize the chemical reactions.

So, Machine intelligence or A.I. is bringing the new future in the field of Chemistry.These tools are impressive in performance and boost the productivity of the chemists.There are some negative signs of thismachine intelligence.Artificial intelligence can be superior than humans but these machines have not any senses like humans.So to achieve its target,it can undergo several dangerous steps to finish its tasks which can be bad or even worst for mankind. So according to Stephen Hawkins, ***" The invention of A.G.I will be the end of Human race."***

Fun fact : Hitler was a great painter . Some of his paintings even often considered as best paintings of that time .


*some one just dropped sodium in water
*me

তারিণী খুড়ো ও মারণ বাতাস

------ আকাশ অধিকারী ও তনয় নাগ

' আচ্ছা খুড়ো তুমি তো সারাজীবনে ভারতের বহু জায়গা ঘুরে বেড়িয়েছো ; প্রচুর অভিজ্ঞতা তোমার । কখনও তুমি সামনে থেকে বিস্ফোরণ বা এই জাতিও কোনো বড় দুর্ঘটনা ঘটতে দেখোনি ? ' ন্যাপলা তার স্বভাব সুলভ ডেপোঁ ভঙ্গিতে প্রশ্নটা ছুড়ে দিলো তারিণী খুড়োর দিকে । আসলে ন্যাপলা সম্প্রতি টিভিতে লেবাননের , বৈরুত এর বিস্ফোরণের খবর টা দেখেছে । তাই প্রশ্নটা তার মনে অনেকদিন ধরেই জমেছিল , আজ তারিণী খুড়ো কে কাছে পেয়ে প্রশ্নটা আর চেপে রাখতে পারেনি বেচারা ।

এদিকে তারিণী খুড়ো আজ বেজায় চটেছে পল্টুদের নয়া ছোকরা চাকরের উপর । নয় নয় করে আজ কম বছর হলোনা তারিণী খুড়ো পল্টুদের বাড়ি আসছে । মুখোশ পড়ে , সানিটাইজার নিয়ে এরকম প্রতিকূল সময়তেও পল্টুদের বাড়ি আসার ইচ্ছা হতে খুড়ো দ্বিতীয়বার ভাবেননি। তিনি পল্টুর নিজের কাকা না হলেও , পল্টু তাকে খুড়ো বলে ডাকে । তার এই অভ্যেস টি সে পেয়েছে তার বাবার থেকে । আর বহাল হওয়া এই নতুন চাকর কিনা তার চায়ে চিনি দিয়ে দিয়েছে ! 'ব্যাটা হুমদো কোথাকার' মনে মনে চায়ের রাঁধুনিকে কয়েক প্রস্থ শুনিয়ে নিজেই ভাবলেন , হয়তো নতুন বলেই এই ছোকরা টি তার অতি প্রাচীন এই অভ্যেস সম্পর্কে ওয়াকিবহাল না। এই সব সাতপাঁচ ভাবতে ভাবতে ন্যাপলাকে জবাব দিলেন , ' সেটা নির্ভর করছে তুই কী ধরনের বিস্ফোরণ বা দুর্ঘটনার কথা বলছিস তার উপর । '

লেবাননের ঘটনাটা তারিণী খুড়োর চোখ এড়ায়নি । সম্প্রতি বৈরুতে একটি বন্দরের নিকট অসাবধানতার সাথে তীব্র বিস্ফোরক অ্যামোনিয়াম নাইট্রেট সঞ্চয় করে রাখার জন্য কোনো ভাবে আগুন লেগে তীব্র বিস্ফোরণ ঘটে । সরকারি রিপোর্ট বলছে ২০০ জনের অধিক লোক নিহত হয়েছেন ও প্রায় 6000 এর অধিক লোক আহত হয়েছেন। এক কালে ল্যাবরেটরির মেটিরিয়াল সাপ্লাই এর কাজ করেছেন তারিণী খুড়ো । খুড়ো তার সেই অভিজ্ঞতা থেকে জানেন অ্যামোনিয়াম নাইট্রেট কতটা ভয়ংকর এক যৌগ ।

' এই ন্যাপলা পল্টুর থেকে একহাত দূরে বস ' তারিণী খুড়ো তার মোটা ফ্রেমের চশমার ভিতর দিয়ে ন্যাপলার দিকে তাকিয়ে একপ্রকার প্রায় গর্জে উঠলেন । সম্প্রতি চিনদেশিও এই ভাইরাস এর আশীর্বাদে , কাছের মানুষদের মধ্যেও অযাচিত এই দূরত্ব তৈরী হয়েছে । ন্যাপলা কে তাই পল্টুর প্লেট থেকে সিঙ্গারা সরাতে দেখে , 'নিউ নর্মাল' এই বুলি আওড়ে বসলেন তারিণী খুড়ো ।

দ্বিতীয় বার আনা চা শেষ করে , একটা এক্সপোর্ট কোয়ালিটির বিড়ি ধরিয়ে তারিণী খুড়ো শুরু করলেন তার আজকের গল্প থুড়ি পূর্ব অভিজ্ঞতার বর্ণনা ' তুই বোধহয় লেবাননের বিস্ফোরণের কথাটা ভাবছিলিস ! আরে ওতো তেমন কিছুই নয় , আর এরকম বিস্ফোরনে ক্ষতি সম্ভাবনা তাদের যারা ওই ছোট রেঞ্জের মধ্যে উপস্থিত ছিল । কয়েক কিলোমিটার দূরে যে লোকটা সেই সময় টিভি দেখছিল , সে মৃদু ভূমিকম্প ছাড়া আর কিছু অনুভব করেছিল বলে মনে হয়না । আজ আমি তোদের যে ঘটনাটার কথা বলবো , সেটা আজ থেকে প্রায় ৩৫ বছর আগে ঘটেছিল এই এক্কেবারে আমার চোখের সামনে । এই বিপর্যয় তোদের ওই লেবাননের বিস্ফোরণ কে ক্ষতির পরিমানে গুনে গুনে ১০ গোল দেবে । যাই হোক শুরু থেকে বলি তোদের ।

বড্ড একঘেয়ে লাগছিলো বলে , রাজারহাটে এক ঘড়ির দোকানর কাজটা ছেড়ে দিয়ে তখন আমি আবার ভবঘুরে । নতুন কোনো কাজ খুঁজছি। এই সময় আমার কাছে খবর আসে টালিগঞ্জের নামকরা অপ্সরা প্রোডাকশন নাকি একটা ছবি বানাচ্ছে । ছবির কিছু গুরুত্বপূর্ণ অংশের শুটিং হবে মধ্য-প্রদেশের ভোপালে । তাই তারা একজন বাঙালি গাইড খুঁজছে যে শহরটাকে ভালো মতো চেনে ও যার কিনা শুটিং বিষয়ক অল্পবিস্তর জ্ঞান আছে । সাত-পাঁচ না ভেবে আমি অ্যাপ্লাই করে দিলাম , ভোপাল শহর এর সমস্ত অলিগলি আমার চেনা না হলেও , ওখানকার এক মহারাজের কাছে এককালে ম্যানেজারির কাজ করেছি বলে বেশ ভালো মতোই চিনি আমি শহরটাকে ।আর শুটিং এর অভিজ্ঞতার ঘটনা তো তোরা আগেই শুনেছিস । অ্যাপ্লাই করার দুদিনের মধ্যেই ভোপালে ওদের দলের সাথে যাবার শমন পেলাম।

২৮শে নভেম্বর ভোরের দিকে নামলাম হাবিবগঞ্জ স্টেশন এ । নভেম্বর এর শেষ হলেও সাথে এক সেট অতিরিক্ত জামা , একটা চাদর আর একটা মাফলার ছাড়া পোষাক আর বিশেষ কিছু নিইনি । স্টেশনে দুটো গাড়ি আগে থেকেই রেডি ছিল । একটাতে আমরা উঠে আরেকটাতে ক্যামেরা ও শুটিং এর অন্যান্য সরঞ্জাম নিয়ে রওনা দিলাম আমাদের গন্তব্য হোটেল ' নিউ ক্যাসেল ' এর উদ্দেশ্যে । ৮টার দিকে পৌঁছেই আগে স্নান সেরে নিলাম । কাজ আজ বিশেষ কিছুই ছিলনা বলে ঠিক করলাম চারপাশটা একটু ঘুরে দেখবো ।

এই নিয়ে দ্বিতীয় বার ভোপাল এলেও লক্ষ করলাম এর মধ্যে চারপাশে অনেক কিছুই বদলে গেছে । হোটেল থেকে বেশ খানিকটা দূরে পায়চারি করতে করতে হঠাৎ বেশ একখানা পেল্লাই সাইজ এর কারখানা নজরে এলো । কাছের এক চায়ের দোকানে জিজ্ঞাসা করে জানলাম , কারখানা টা নাকি খুব বেশি পুরানো নয় , মেরেকেটে পনেরো-ষোলো বছর হবে হয়েছে এখানে । দোকানদার এর কথা শুনে বুঝলাম , এখানে নাকি কীটনাশক তৈরী হয় । আরো কিছুক্ষন পায়চারি করার পর ফিরে এলাম হোটেলে । বিকেলের দিকে আরেকবার গেলাম ওই কারখানার কাছে । কেন জানিনা আমার মন খুব টানছিল আমাকে ওই দিকটায় । বিকালে গিয়ে ওই কারখানার এক শ্রমিক এর সাথে ওই চায়ের দোকানে আলাপ হয় । তার সাথে কথা বলে বুঝলাম এরা কারবাইল নামের একপ্রকার কীটনাশক তৈরী করে , যার বাণিজ্যিক নাম 'সেভিন' । 1-ন্যাপথল নামের এক যৌগের সাথে মারাত্মক রাসায়নিক মিথাইল আইসোসায়ানেট বা MIC র বিক্রিয়া ঘটিয়ে এটা প্রস্তুত করা হয় । কিরে ন্যাপলা হাই উঠছে ? ' বলেই একটু হেঁসে আবার শুরু করলেন তারিণী খুড়ো , ' এসব জিনিস তোদের মাথার উপর দিয়ে যাচ্ছে বুঝতে পারছি , তবে আমার গল্পে এদের ভূমিকা খুব গুরুত্বপূর্ণ। তোরা নিশ্চই শুনেছিস যে স্বাধীনতার জন্য লড়াই করা বিপ্লবীরা ইংরেজদের হাতে ধরা পড়লে , পাছে মুখ ফসকে কোনো গোপনীয় কথা বেরিয়ে যায় সেই ভয় , সায়ানাইড এর বড়ি খেয়ে দেশের জন্যে আত্মবলিদান দিত । এই আইসোসায়ানেট যৌগটাও খানিকটা ঐরকমই । বিষক্রিয়ায় এটিও সায়ানাইড কে সমানে সমানে পাল্লা দিতে পারে ।

হোটেলে যখন ফিরলাম তখন , সূর্য অস্ত গেছে । সন্ধ্যাবেলা টা পুরো শুটিং পার্টির সাথে আড্ডা মেরেই কেটে গেল। পরের তিনদিন খুব ব্যাস্ততায় কাটলো । চতুর্থ দিন একটু সময় পেয়ে আবার ঘুরতে গেলাম কারখানার ওই দিকটায় । আজ একটা চার-পাঁচ বাচ্চা মেয়েকে কারখানার আশেপাশে ঘোরাঘুরি করতে দেখে একটু আশ্চর্য হলাম । মেয়েটিকে জিজ্ঞাসা করে জানলাম তার বাবা মা কেউ নেই । এই সামনেই এক মন্দিরে সে রাত কাটায় , আর সারাদিন ভিক্ষা টিক্ষা করেই দিন কেটে যায় । আর মাঝে মাঝে এই কারখানার কাছে ঘোরাফেরা করে , কারখানার কর্মচারীরা কিছু সাহায্য করে এই আশায় । মেয়েটিকে দেখে কেন জানিনা আমার বড় মায়া হলো । ঠিক করলাম , কলকাতা ফেরার সময় একে সঙ্গে করে নিয়ে যাবো। তো যাই হোক সন্ধ্যার দিকে হোটেলে ফিরে দেখি ডিরেক্টর তাসের আড্ডা নিয়ে রেডি , সন্ধ্যেটা ওই আড্ডাতেই কেটে গেল ।

রাতের দিকে ছাদে একটু হাঁটাহাঁটি করা আমার অভ্যাস বেশ যুবক বয়সের, আর সেটা একটু বেশি রাতের দিকে হলেই ভালো হয়, ওখানেও রাতের দিকে একটু হাঁটছি, তারিখ টা ২রা ডিসেম্বর রাত, ৩রা ডিসেম্বরও বলা চলে, রাত বারোটা বেজে গেছে অনেক্ষন হলো , হঠাৎ একটা মৃদু সাইরেনের শব্দ শুনতে পেলাম ও হোটেলের জানালা দিয়ে লক্ষ করলাম নিচে লোকরা কোনো কারনে ছুটো ছুটি শুরু করে দিয়েছে । একটু হালকা শ্বাসকষ্ট অনুভব হওয়া তে জানালা বন্ধ করে সাথে সাথে ঘরে ঢুকে গেলাম, প্রথমে ঠিক বুঝে উঠতে পারিনি যে কি ঘটছে, পরে যা শুনেছি সেটাই বলছি তোদের, ফ্যাক্টরি তে মিথাইল আইসোসায়ানেট নামে এক কেমিকাল রাখা হতো আগেই বলেছি তোদের , আর ওই কোম্পানির কাজ ছিল "সেভিন" নামে এক কীটনাশক কে তৈরী করা , সেটাও তোরা জানিস ।

তো যাই হোক গোলযোগ এর কারনে ওই কেমিক্যাল এর চেম্বারের প্রেশার উত্তরোত্তর বাড়তে থাকে, এবং রাত সাড়ে নয়টায় নাকি পাইপ লাইন ওয়াশের কাজও শুরু হয়ে যায়, কিন্তু তখন একটা ছোটখাটো ফাটল দেখা যায় পাইপ লাইনে, ফ্যাক্টরির লেবাররা সেই ফাটল কোনওমতে অস্হায়ী মেরামত করে। তারপর যখন তারা বুঝতে পারে যে ঘটনা হাতের বাইরে চলে যাচ্ছে, সেফটি চেম্বার গুলো খোলার চেষ্টা করা হয়, কিন্তু দুর্ভাগ্যবশত ৩ টের মধ্যে একটা চেম্বারও সেদিন কাজ করেনি, ঘুমের মধ্যেই আর্তনাদে ফেটে পরে গোটা ভোপাল শহর, গ্যাস টা বাতাসের চেয়ে কয়েকগুন ভারী হওয়ায় নিচের দিকে থিতিয়ে থাকে । এর ফলে সবচেয়ে বেশি ক্ষতিগ্রস্থ হয় শিশুরা । হাসপাতালে আর জায়গা পাওয়া যাচ্ছিল না পর্যন্ত, সকলের চোখ জ্বালা আর হাঁপানির সমস্যা শুরু হয়, ওখানকার ডাক্তাররা প্রথমে অ্যামোনিয়া ঘটিত সমস্যা ভাবলেও পরে বুঝে উঠতে পারেনা এগুলো কিসের থেকে হচ্ছে । ফলস্বরুপ বাড়তে থাকে লাশের সংখ্যা। ভোপালের সবাই সেদিন একটু বৃষ্টির জন্য চেয়ে ছিল আকাশের দিকে, পরের দিন থেকে শুরু হয় মৃত্যুমিছিল...

পল্টু হঠাৎ করে বলে ' তা খুড়ো তোমার তো কিছু হল না?? তুমি তো দিব্যি আছো। '

খুড়ো হাসতে হাসতে বলে সে গল্প না হয় অন্য আরেকদিন হবে । কিন্তু আফসোস আমার একটাই সেই বাচ্ছা মেয়েটাকে আর দেখতে পেলাম না , জানিনা সে আদৌও কাটিয়ে উঠতে পেরেছিল কিনা সেই নির্মম সময় যখন চারিদিকে ছড়িয়ে ছিল বিষাক্ত বাতাস !!!

বলতে বলতে খুড়োর দুচোখে চিকচিক করে উঠল কয়েক ফোঁটা জল।

(উপরিউক্ত গল্পটি ১৯৮৪ সালে ঘটে যাওয়া ভারতের ইতিহাসের সর্বনিকৃষ্ট শিল্প বিপর্যয় ভোপাল গ্যাস বিপর্যয় এর উপর আধারিত । এই বিপর্যয়ের ফলে প্রায় ৬ লক্ষ লোক ক্ষতিগ্রস্থ হন ও প্রায় ১৫০০০ লোক মৃত্যুবরণ করেন । গল্পের চরিত্র গুলি ছাড়া অধিকাংশ বর্ণনাই , বিভিন্ন পত্রিকায় লেখা এই ঘটনার বিবরণের উপর আধারিত ।)

Image source - Google (cartoon drawn by R K Laxman)

Fun fact : Do you know , In Switzerland it is illegal to own just one guinea pig.

THE SCENT OF CHEMISTRY

Souvick Karmakar (2nd sem)

INTRODUCTION:

From the charming smells of flower gardens to the garbage dumps of the cityside, from the smell of a delicious chocolate cake to the sweet smell of perfumes, from dawn to dusk we can smell almost everything. And smells are important to sense our surroundings. And for this purpose we all have a nose which helps to sense the smells. Though we all know these things.

But wait!!!....

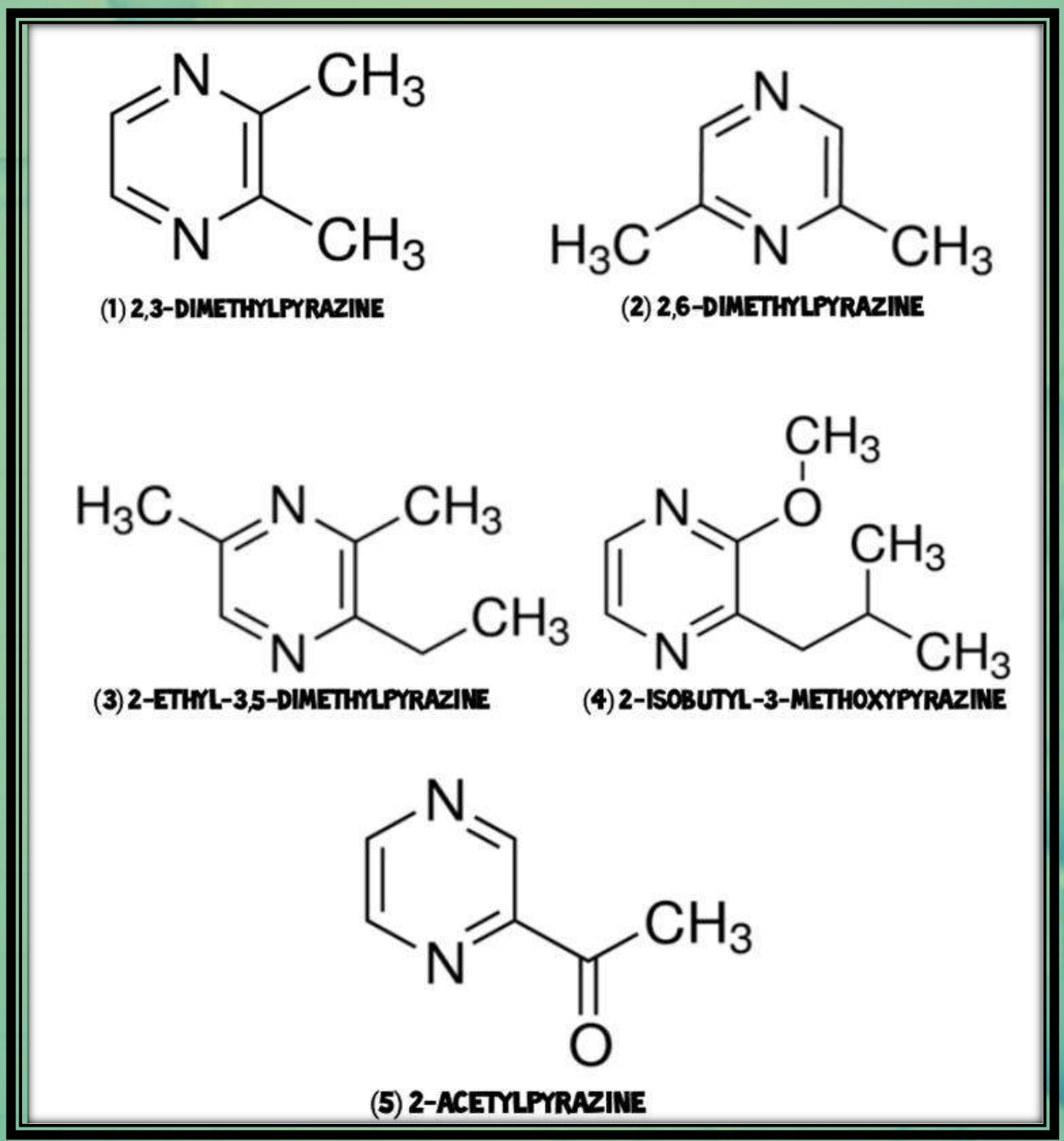
Did you ever think how do we smell?

HOW DO WE GET SMELL?

Actually, it's a very interesting topic not just only for a large number of people but scientists too throughout the world, and according to their research they observed that to be smelt, the molecules must vaporise, either as a result of evaporation of a liquid or sublimation of a solid (e.g. menthol or camphor). They are therefore fairly small molecules, with MW of below about 300 {but some small molecules, like glucose (MW = 180), are odourless if they are non-volatile} and must also at least have some solubility in water and be lipophilic in nature (Note: some volatile molecules cannot be smelled, such as N_2, H_2O_2, $O_2$and, tragically, CO.). These are the characteristics of the molecules to have a smell, ***so now we have a good question how we smell the odour...?***

Let’s come to the answer..

Actually when molecules pass up the nose, they reach the olfactory epithelium (a region of tissue with an area of around 3-4 cm^2, near the top of each nostril).Here the volatile molecules meet odour receptors, which are covered in mucus-coated hairs which are called 'Cilia’. Then the molecules dissolve in the mucus (and thus need to have some water-solubility) and are carried to the receptors, by specific 'transport' proteins. When we have a cold, our sense of smell is reduced because molecules cannot reach the smell receptors.



Compound – 1,2,3,4,5

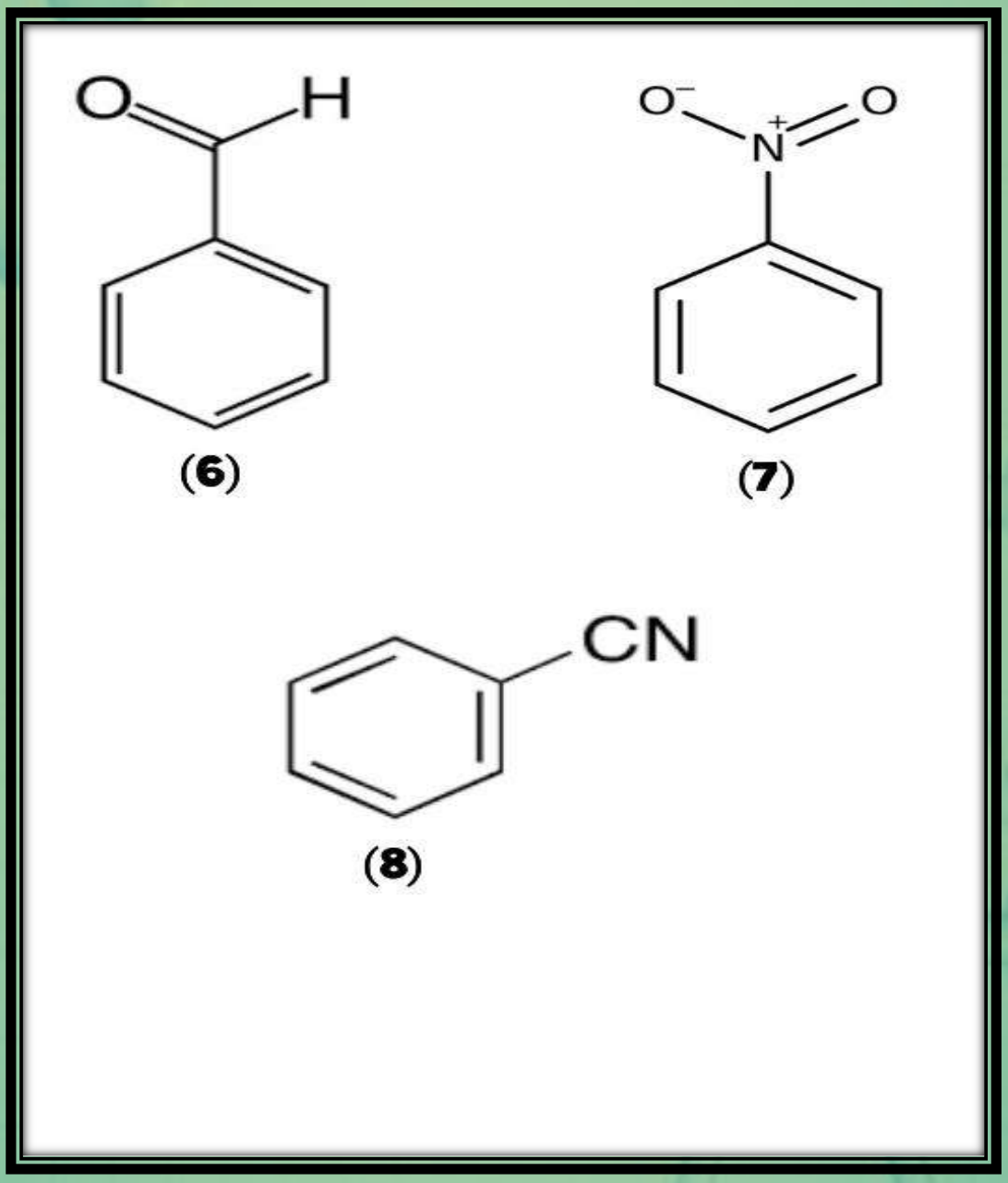
Simple alkylpyrazines like 2,3-dimethylpyrazine (1) and 2,6-dimethylpyrazine (2) are responsible for the nutty smells of roasted peanuts and baked bread; just a small tweak, and 2-ethyl-3,5-dimethylpyrazine (3) is one of the 'chocolate' molecules that rounds out the roasted smell of coffee. Substituting slightly different groups to give 2-isobutyl-3-methoxypyrazine (4) gives green bell peppers their distinctive smell, which can be detected as low as 0.002 parts per billion; and 2-acetylpyrazine (5) smells of roasted popcorn.

Scientists have tried to make links between molecules and their smell using two different types of theory – one, based on the shape of molecules and the other, on their vibrational properties.

1. Shape theory

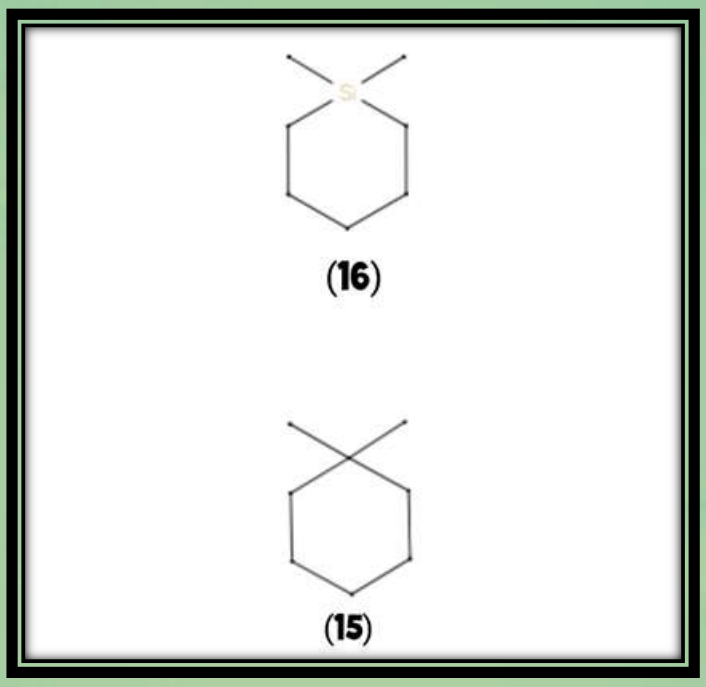
In 1946, Linus Pauling proposed that the smell of a molecule was determined by its shape and size. This idea was taken up by R. W. Moncrieff, and developed by John E. Amoore, and was based on a 'lock-and-key' principle. Amoore suggested that there were seven types of 'primary' odours - camphoraceous, musky, floral, pungent, ethereal, minty and putrid (other types such as almond, aromatic and aniseed were also possibilities). He hypothesised that these corresponded to different shaped receptors, which recognised different 'shaped' odorants. The overall smell was determined by the strength of binding of a molecule to the various receptors.
In the middle of 1960s this theory was believed to be inadequate, and was supplanted by the 'weak shape' or odotype theory. This theory, again based on the shape of molecules, suggested that receptors probe sections of a molecule, and that the overall smell reflects the combination of the responses from the different receptors.

Like most processes involving recognition of molecules, odotype theory was based on a fit with a receptor, similar to enzyme-substrate interactions. Scientists looked for common structural features in molecules of a particular shape. benzaldehyde (6) for example, is well known for its use in almond essence. Molecules 7,8 have similar, but not identical, 'almond' smells. Note that all these 'almond' molecules, bar one, share the structural element of a multiple bond conjugated with a C=C bond (or its equivalent in a benzene ring). The exception is hydrogen cyanide, a molecule with a very different structure.



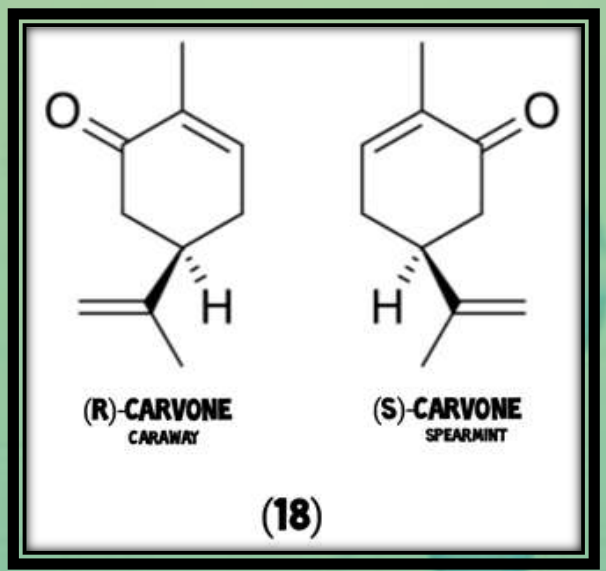
Compound -6,7,8

Significant smell differences have, however, been reported for molecules with similar shapes. For example, 1,1 dimethylcyclohexane(15) is described as camphoraceous with a faint sweet fruity, powdery, background; the Si substituted analogue, 1,1-dimethyl-1-silacyclohexane (16) has an intense chemical-green note reminiscent of cis -3-hexenol, with a faint camphoraceous background.



Compound -15,16

One argument generally given in favour of odotype theory is based on chiral molecules. While most enantiomer pairs have similar smells (to humans), a significant minority have different smells, the most familiar example being the isomers of carvone(18) (spearmint and caraway smells).



compound 18

A ‘shape-based' theory explains this difference in odour by pointing out that binding of optical isomers to chiral protein-based receptors will differ, whereas the two molecules will have identical infrared spectra. Biophysicist, Luca Turin suggested that one isomer may be bound to the receptor so that its carbonyl group is oriented unfavourably with respect to excitation, explaining the difference in odour.

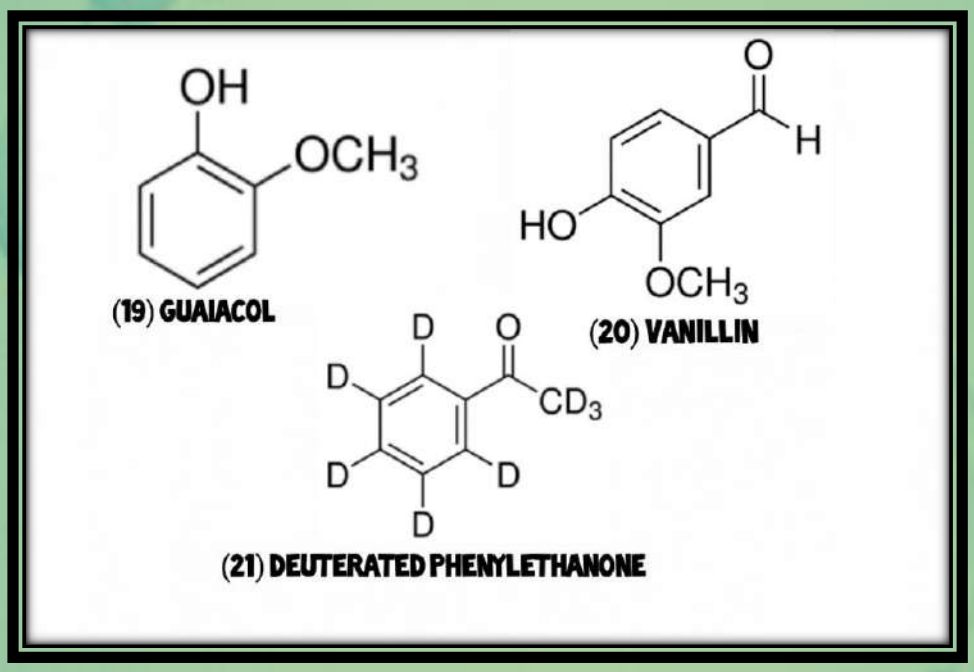
2. Vibrational theory

In 1938 Malcolm Dyson put forward the vibrational theory of smell, which was developed by Robert H. Wright (1964), and has recently been modified by Turin (1996). According to Turin, receptors detect vibrational frequencies of odour molecules. Molecular vibrations, he suggests, are transmitted from olfactory receptor proteins (which effectively behave as vibrational spectrometers) via a mechanism of electron tunnelling. When the receptor site is empty, electrons are unable to tunnel across (traverse) the binding site, because no suitable pathway exists; when an odorant is bound, electrons can lose energy by tunnelling, through exciting an appropriate vibrational mode of the molecule. This electron flow is transmitted through a zinc ion to a G-protein, activating the receptor.

In favour of the vibrational model, Turin argued that the presence of certain functional groups, such as -SH and -NO_2, often gives rise to characteristic odours (such as 'bad egg') that appear to reflect the functional group rather than molecular shape.He suggested that the 'unique' smell character of thiols (most famously used by skunks) coincides with the S-H stretching frequency ca 2550 cm-1, a region found in few other molecules, though decaborane, , B10 H14, whose B-H stretching vibrations also in this region, has a similar smell. However, not all thiols have this nauseating smell, a prominent exception being 1- p -methene-8-thiol, the key odorant responsible for the smell of grapefruit.

Turin went on to make the following prediction based on his theory:

- A mixture of guaiacol (19) and benzaldehyde (6) would have a smell similar to vanillin (20) because, taken together, these two molecules contain the same functional groups and hence vibrational frequencies, as vanillin.; the deuterated phenylethanone (21) has a less sweet, more solvent-like smell than phenylethanone. These molecules have significantly different vibrational spectra but identical shapes. However, again independent research revealed that volunteers were not able to detect any difference.



Compound -19,20,21

Modern Insight:

It appears, then, that neither theory is correct. Modern biochemical understanding considers that the arrival of the smelt molecule activates the olfactory receptor (OR) proteins, which span membranes and contain seven helices (7TM receptors). Nerve impulses are sent from the receptors to specific areas of the brain responsible for smell (glomeruli in the olfactory bulb). Signals from each kind of receptor cell are believed to come to the same glomerulus. The pattern of signals arriving at the brain constitutes the 'smell' of the molecule perceived by the brain.

Drawing – Tanay nag

In 1991, Richard Axel and Linda Buck reported on the family of genes coding for odorant receptors. (This work was recognised by the award of the Nobel Prize in physiology or medicine in 2004.)

Buck and her team went on to study the interaction between individual odorant receptors and C4 -C9 aliphatic odorants with different functional groups (e.g. alcohol, carboxylic acid), and found that:

- **Each olfactory receptor (OR) can recognise many odorants;**
- **Each odorant can be detected by several different ORs;**

- **Different odorants can be detected by different OR combinations, leading to distinction by the brain.**

The researchers concluded that it is not a case of one odorant for one receptor but rather that different molecules activate a different combination of ORs, and so sends a different signal to the brain.

Given that there are around 340 different active ORs in humans (in contrast to around 1000 in mice and rats),this system can discriminate between large numbers of odorants. This explains why though there are only a few hundred different receptors, humans can recognise 10,000 or more different odours. Even small changes in the odorant molecule, such as using octan-1-ol instead of octanoic acid, produces a change in the combination of ORs detecting it. The researchers also found that a change in odorant concentration may alter its receptor code. This explains why sometimes a substance has different smells at different concentrations; for example, dimethyl sulphide.Humans devote a smaller fraction of the olfactory epithelium to olfactory neurons compared with other animals, where the density of receptors is also much greater. Dogs, for example, can distinguish breath samples of lung and breast cancer patients, and urine samples from bladder cancer patients, evidently because of the presence of minute quantities of volatile organic molecules, acting as biochemical markers (though the molecules responsible have not yet been identified). In a recent experiment olfactory receptor were expressed in yeast cells and attached to a sensor chip, and shown to keep both the selectivity and sensitivity of the natural receptor. This could form the basis of bio-electronic sensors that could detect odorants in urine, for example, that act as markers for the presence of a disease, drugs, or explosives. This could add an exciting new dimension to the chemistry of smell.

CONCLUSION:

Over all, the study on origin of smells can give us a better understanding of the underlying biochemical processes involved when organisms manage to identify a smell of an object based on hundreds of chemicals in a few milliseconds would likely impact many scientific fields.

Indeed, deciphering what odours (elements and/or configurations) are perceived in a mixture may contribute to the efficiency of flavour analysis, the identification of key components of food acceptance or disliking, and the elaboration of food flavours and perfumes.

Moreover, extending our investigations on the odour/smell processing of natural mixtures would shed light on the ability of organisms, including humans, to code complex information in the olfactory brain and how, through development, learning, or evolution, the resulting smell are stored as perceptual objects and reused by individuals.

To take up these further research challenges, one should favour a systemic approach that would combine several investigation levels thus gathering cellular, neurobiological and psychological aspects both in human and other animal species. Indeed, multidisciplinary studies may help to tackle specific questions regarding the "Smells" and thus would likely bring the field of ‘smells’ forward.

REFERENCE AND ACKNOWLEDGEMENT:

1> www.frontiersin.org
2> edu.rsc.org
3>www.google.com

Drawing – Tanay nag

Elements in the same group of the periodic table have similar chemical properties.

---- QUIZ SECTION ----

Think chemically

1 . I am often considered to be one of the roots of the fall of Rome. My chemical symbol comes from the way I was used in Roman times as it is an abbreviation of the Latin word for me. I am excellent for blocking radiation, but I can poison you all the same. What element am I?

2 . It is a rapidly acting chemical that can exist in various form. It's conjugate acid is called prussic acid(poisonous, flammable) and was used as chemical weapons during World War 1. More toxic in gaseous form and cigg smoke contains traces of it . Identify the chemical I am talking about .

3 . It can dissolve more substances than any other liquid including sulfuric acid.This compound consists of 70% of human brain . Plays major role in temperature control . Henryndish discovered the components and their compositions in this molecule . Identify the compound, from the above description .

4 . I am an element of the periodic table. I was probably named after a German word, which means prong or tooth. Old alchemists burned me in air to form something ,which seems like white snow. The "Charaka Samhita" mentions a metal, which when oxidised produces "pushpanjan" , thought to be an oxide of myself.I feel proud of myself that,I was first discovered in India,Who am I? (4 letters)

5 . I am present in a popular Bengali idiom.I also somehow helped Byomkesh Bakshi in 'Durga Rahasya' to find out the hidden . I am used to make buffer solutions in biochemistry . I also used as a fire retardant, as an anti-fungal compound, in the manufacture of fiberglass,etc .Can you guess my name? (5 letters)

6 . .I was an Indian organic chemist, noted for my works in the fields of organic chemistry and phytomedicine.I was the first woman to recceive a doctorate of science from an Indian university.Google Doodle paid tribute to me by celebrating my 100th birthday on 23rd September 2017. CanCan you help me with my name? (5,10 letters)

7 . I am a weakly radioactive metallic element.I was named after Norse,the god of thunder, whom we often see in the movies of a popular franchise, sometimes holding a hammer in his hand.Who am I? (7 LETTERS)

8 . .I am a fictitious medicine ,invented by a scientist having a pet cat, named Newton. I can cure almost every ailment.Seems like a miracle ,but it's true. Can you identify me? (10 letters)

KNOWLEDGE CLOUD

By Siddhartha Das

1 . Why does the planet Uranus, Rich in Methane and Hydrogen, not Burn?

Ans : Planet Uranus is indeed rich in extremely flammable gases, methane and hydrogen. But the burning of these gases requires oxygen. While we take oxygen for granted in Earth, Uranus simply doesn't have enough for the flammable gases to burn

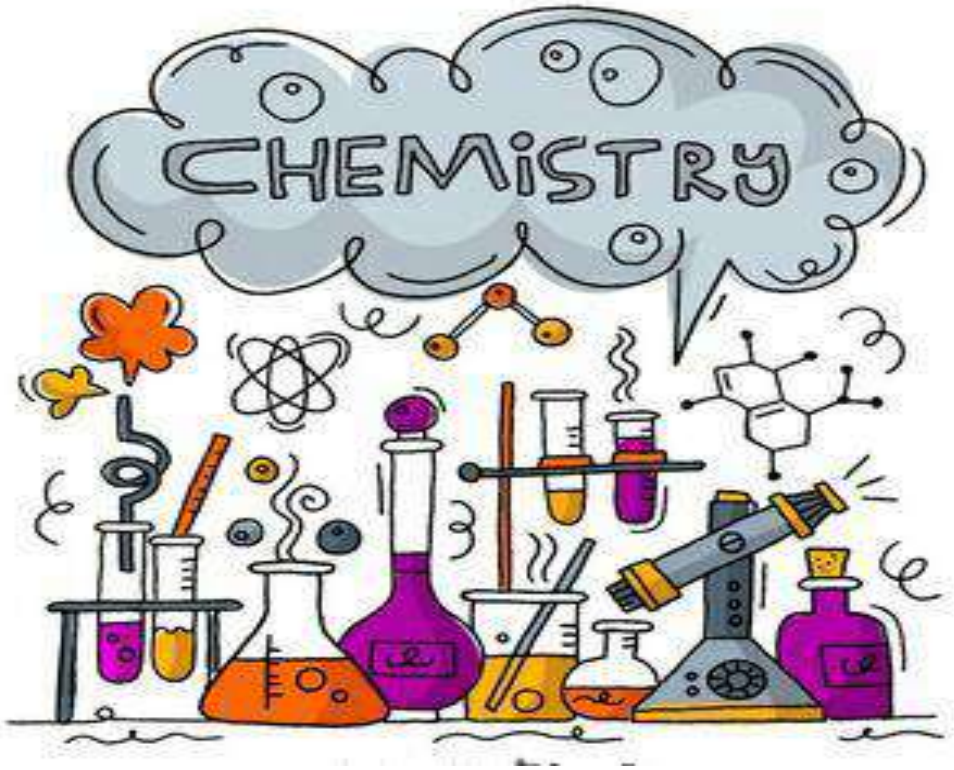
2 . Why do onions makes you cry?

Ans : A relatively complex process takes place when you cut an onion. This results on the release of propanethial-S-oxide, which is an irritant of the lachrymal glands, which release tears.

3 . How does the sun burn without Oxygen?

Ans : Sun is made mostly of hydrogen (besides helium), which is a highly flammable gas. But, as in the case of planet Uranus, there is no oxygen at the Sun. In classical terms, we need oxygen for a fire to burn. But the Sun is not actually on fire. Its heat and light come from nuclear fusion reactions, mainly combining hydrogen to make helium. This process does not require oxygen to happen.

CREDITS :



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প্রিয় অপু তথা আমাদের কলেজের এক প্রাক্তন ছাত্র কে , আমাদের তরফ থেকে একটি ছোট্ট শ্রদ্ধাঞ্জলি.....

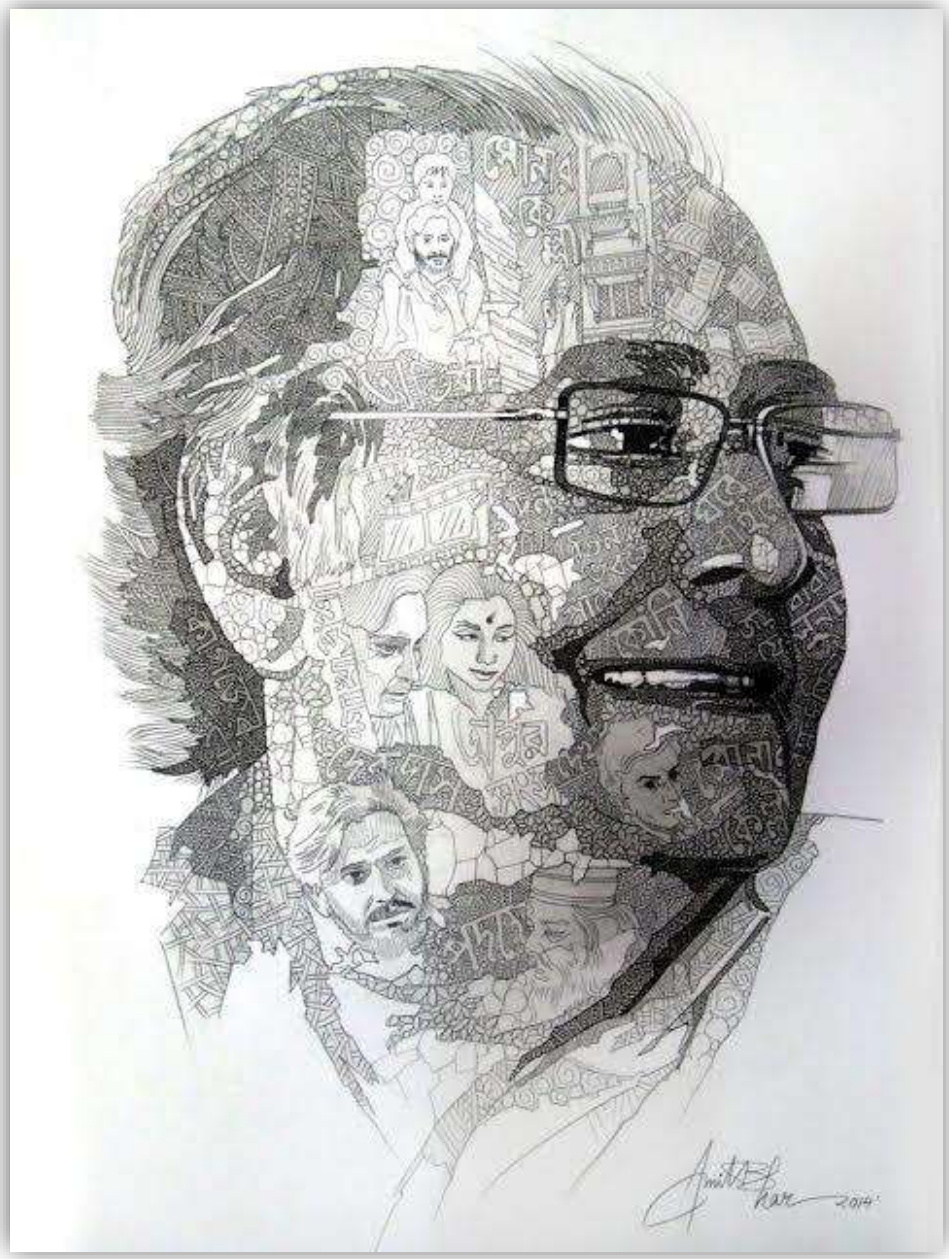

Image source – Google

মোর লাগি করিয়ো না শোক,

আমার রয়েছে কর্ম, আমার রয়েছে বিশ্বলোক।

মোর পাত্র রিক্ত হয় নাই--

শূন্যেরে করিব পূর্ণ, এই ব্রত বহিব সদাই।

--------- রবীন্দ্রনাথ ঠাকুর (শেষের কবিতা)

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Thank you.....