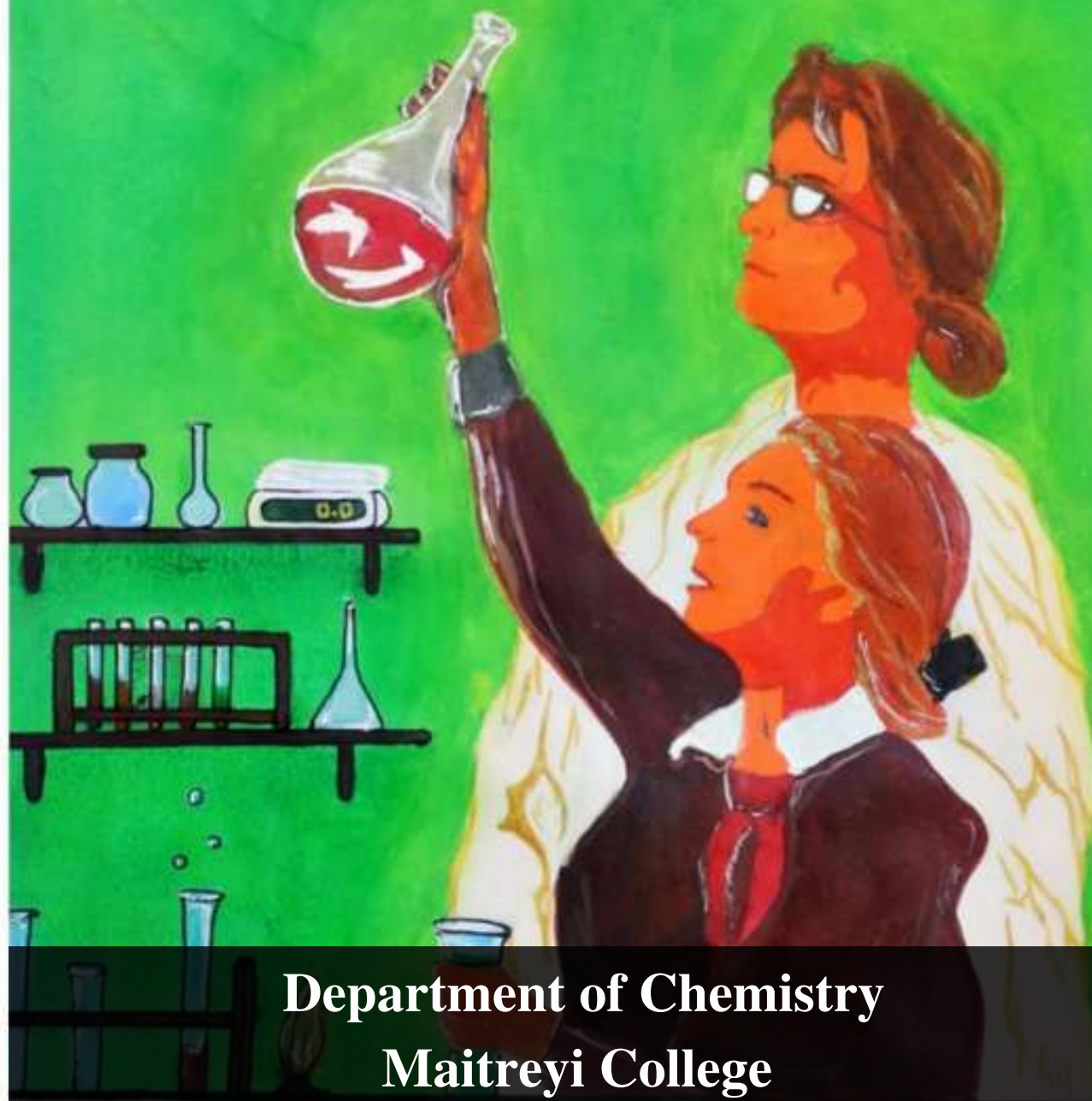


# CHEMZONE

The Chemistry E-Bulletin 2021



**Department of Chemistry**  
**Maitreyi College**  
**University of Delhi**

# From Principal's Desk



**Dr. Haritma Chopra**

Greetings from Maitreyi College !

Dear Readers,

I am delighted to know that the Department of Chemistry is bringing out the first annual edition of CHEMZONE, The Chemistry E-Bulletin 2021. We, at Maitreyi college emphasize at escalating the students' potential with indispensable support, guidance and encouragement from our committed faculty. Our endeavor has been to contribute to Higher Education not only by enabling the students to get a degree in Science, Commerce or Humanities but also by developing in them the aptitude to think imaginatively and articulate their views with confidence and conviction. This issue is a promising platform to encourage the students to display their subject specific expertise, creativity and innovative ideas.

I congratulate and acknowledge the team work of editorial team and the students who have utilized their time in a positive ingenious manner through the creation of the first edition of this bulletin during the on going pandemic situation

Best Wishes

Dr Haritma Chopra  
Principal (Officiating)

# Message from the Convener



**Dr. Ramesh Kumari**

**Greetings from the Department of Chemistry!**

**I am proud and delighted to present to you the first annual edition of CHEMZONE, The Chemistry E-Bulletin 2021. This issue is special as this is created by the students and teachers working from their homes during the COVID -19 lockdown period, expressing their views meaningfully in a positive manner in the time of great conflict, uncertainty and unpredictability.**

**The present bulletin is the team work of students of different streams – a creative venture to bring joy, faith and hope through their innovative thinking and artistic accomplishment.**

**I congratulate the entire editorial team and wish all the students best of luck and hope they continue to scale greater heights in their future endeavors.**

**We hope you enjoy this first edition.**

**Let's keep the conversation going**

**With Best Wishes**

**Dr. Ramesh Kumari**

**Convener**

**(Teacher-in -Charge)**

**Department of Chemistry**

# Editorial Address

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The Department of Chemistry, Maitreyi College announces the launch of CHEMZONE, The Chemistry E-Bulletin 2021. The notion of designing the first edition of the department bulletin commences with the amalgamated efforts of the convenor, members of editorial board and students. The current pandemic condition couldn't cast down the vigour and zeal of the team members to work coherently.

Chemzone provides an exemplary platform to harness the synergy of chemistry and chemical advancements in the form of artistic illustrations, anecdotes, knowledge cladded brain teasers etc. Few sections are drafted in such a manner to manifest the thoughts, emotions and experiences of the teachers and students beautifully. In a nutshell, the bulletin showcases an abstract assemblage of scientific interpretative approach. It comprehensively covers articles under the diverse topics of creative writing, critical coverage of scientific research, retrospective segment; a trip down the memory lane (meethi yaadein), factual description, fun filled chemistry puns etc. The flowing ink section acknowledges the pivotal role of women researchers in some of the major breakthroughs in the scientific research. The fine art segment constitutes the artistic competence of the students and the photographic collage of various departmental activities, expeditions and events. Candid debate is the aesthetic way to express the point of view of students on certain topics. In view of this, an interesting blog section highlighting a recent research topic is created for debate among the students. The editorial team appreciate the way students participated and defended their thoughts through rational scientific approach.

With the scientific conviction and noble approach, we present CHEMZONE, The Chemistry E-Bulletin 2021.



# EDITORIAL BOARD



**Dr. Haritma Chopra**



**Dr. Ramesh Kumari**



**Dr. Gazala Ruhi**



**Dr. Kiran Soni**



**Dr. Hema Bhandari**



**Dr. Lata Vodwal**



# Student Editorial Squad



**Stuti Dureja**  
Editorial Head



**Aditi Singh**  
Creative Head



**Khyati Sharma**  
Content designing



**Juhi**  
Content designing



**Shristi**  
Quiz & puzzles



**Aditi Govind Singh**  
Cover page  
designing



**Leesha**  
Cover page  
& logo  
designing

# President's Note

## Stuti Dureja

---

I am honored to be part of the first edition of CHEMZONE, The Chemistry E-Bulletin 2021. I would take this opportunity to thank our Teacher-in-Charge Dr. Ramesh Kumari, the teacher editorial board, the student editorial team, and our entire chemistry department for their untiring efforts.

“Together it is possible” is our mantra for this year because amidst a global pandemic chemistry department proudly introduced its first edition of CHEMZONE. Together we have evaporated our fears, distilled the essence of our learning, and crystalized it in the form of this e-bulletin. As we resumed working together through virtual platforms, this bulletin tested our strength to rebound, reorganize and reimagine. We did so knowing together it is possible.

I am grateful to be part of this department and spend my three years grasping the lessons that will be with me forever. Chemsophy our annual chemistry festival was the highlight of the days I spent at this institution, Radha Sai Ram Chemical Society has been more than a society to me, and it has been a learning experience which would engulf me with nostalgia for life.





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# DEPARTMENT OF CHEMISTRY

## Profile

The Department of Chemistry was established in 1967 in the old building of Maitreyi College. The Department offers B.Sc. (Hons.) in Chemistry and interdisciplinary courses of B.Sc. (Prog.) Physical Science and Life Science.

## Objectives

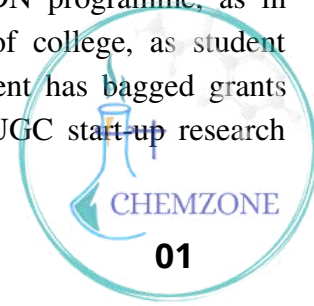
The Department envisions being a part of the College's mission to be recognized as a place of knowledge and the centre of excellence. The Department offers the highest quality of Chemistry undergraduate curriculum for efficient learning, teaching, research and mentorship and holistic approach for the overall development of the students.

## Amenities and facilities

The Chemistry Department has three spacious Laboratories, well equipped with sophisticated instruments to support the smooth conduct of practical and research work at undergraduate level. The skilled Laboratory staff manage availability of chemicals, proper handling of apparatus, calibration of instruments etc. The Departmental library owns a rich archive of more than 500 Chemistry books for the benefit of students. Students have the privilege to access computers, laptops and ICT equipped classrooms.

## Achievements

Awards and recognitions at national and International levels are another accomplishment of the faculty. The Department has shown active participation as Resource person at NCERT, IGNOU, PGDN programme, as in charge in NCC and NSS units of college, as student union advisors etc. The Department has bagged grants for 3 innovation projects and 4 UGC start-up research projects.





# FACULTY

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The Chemistry Department has dedicated academic staff with thorough subject pedagogy and excellent proficiency in research. The Department proclaims 40 research publications, 4 books, 2 patents and several e - modules published by the faculty members in past five years. Several awards & accolades are conferred upon the faculty of the department.

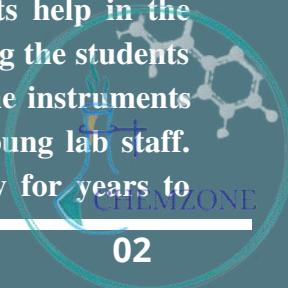
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# NON-TEACHING STAFF

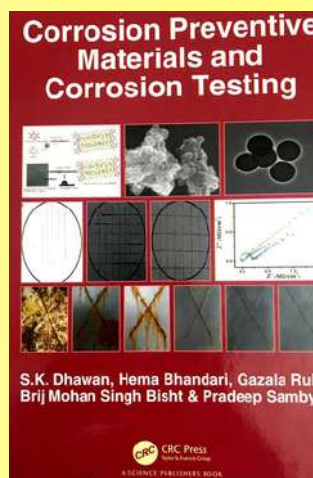
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The non-teaching staff is the backbone of the Department. Their consistent efforts help in the smooth functioning of the laboratory work. They have inculcated lab etiquettes among the students like, judicial use of chemicals, follow lab safety protocols, working carefully with the instruments etc. The Chemistry Department has a perfect amalgamation of experienced and young lab staff. The faculty members and the lab staff of the department have worked coherently for years to ensure the lab learning process fun.



# ACCOMPLISHMENTS

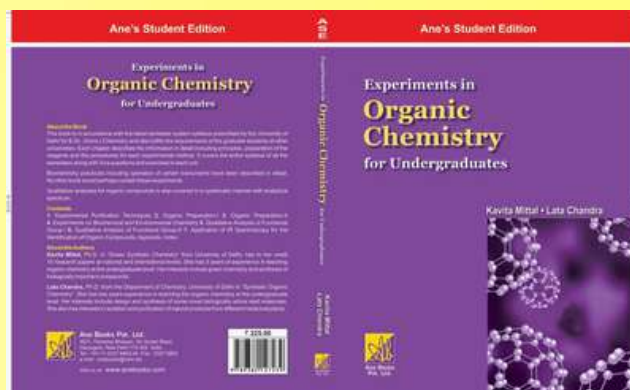


**Dr. Hema Bhandari**  
**Research Area:**  
**Conducting polymer based corrosion resistant coatings**

**Dr. Gazala Ruhi**  
**Research Area:**  
**Smart self healing nano composite coatings**

(19) <b>United States</b>	
(12) <b>Patent Application Publication</b>	(10) Pub. No.: US 2015/0184304 A1
Kumar et al.	(43) Pub. Date: Jul. 2, 2015
Publication Classification	
(54) <b>SELF HEALING ANTI CORROSIVE COATINGS AND A PROCESS FOR THE PREPARATION THEREOF</b>	(51) Int. Cl. (2006.01) C23F 11/06
(71) Applicant: Council of Scientific and Industrial Research, New Delhi (IN)	(52) U.S. Cl. CPC C23F 11/06 (2013.01)
(72) Inventors: Dhawan Sundeep Kumar, New Delhi (IN); Anoop Kumar Sasidharan, New Delhi (IN); Bhandari Hema, New Delhi (IN); Ruhi Gazala, New Delhi (IN); Sharma Brijesh, New Delhi (IN)	(57) <b>ABSTRACT</b> The present invention provides self-healing anti corrosive coatings comprising composites of conducting polymers, chitosan and silica particles along with epoxy useful for corrosion prevention under highly corrosive medium like 3.5% NaCl. Tafel plots exhibits significantly high corrosion protection efficiency (99.99%) for the epoxy coatings with 2.0 wt % loading of chitosan-polymer composite. The weight loss measurements and salt spray test results clearly exhibit superior corrosion resistance offered by coatings with chitosan-polymer composite. The synergistic interaction between chitosan and polypyrrole in the composite is expected to improve the corrosion resistance properties of the coatings. The SiO <sub>2</sub> particles present in the composite reinforce the integrity of the
(73) Assignee: Council of Scientific and Industrial Research, New Delhi (IN)	
(21) Appl. No.: 14/486,583	
(22) Filed: Sep. 15, 2014	
(30) Foreign Application Priority Data	

**Dr. Hema Bhandari & Dr. Gazala Ruhi**



**Dr. Lata Vodwal**



# Radha SaiRam Chemical Society

The Radha SaiRam Chemical Society of Chemistry Department was established in the year 1992. The society was named in the memory of Ms. Radha Sairam. The Department organizes various activities, lectures, industrial and laboratory visits, fests, student election etc., under the aegis of this society. Chemsophy-The Departmental Fest and Rafia Memorial Lecture have been organized for many years with student participation from all the three years. The student representatives and their assigned portfolios for the year 2020-21 are; Stuti Dureja (President), Aditi Singh (Vice President), Kajal (General Secretary), Riya Nimbekar(Treasurer) and Juhi (Joint Secretary). The other active members, carrying out important responsibilities are; Leesha and Aditi Govind Singh (Art Head), Babli (Volunteer Management), Priyansha Jain and Ritika Sabharwal (Social Media Head).



**PRESIDENT**



**VICE PRESIDENT**



**TREASURER**



**JOINT SECRETARY**



**ART HEAD**



**ART HEAD**



**GENERAL SECRETARY**



**SOCIAL MEDIA  
HEAD**



**SOCIAL MEDIA  
HEAD**



**VOLUNTEER MANAGEMENT  
HEAD**





# SUMMER INTERNSHIP PROJECTS, 2020

## CENTRE FOR RESEARCH, MAITREYI COLLEGE

### **"Ayurveda- A Pragmatic Plan Against COVID-19."**

*Mentor - Dr. Ramesh Kumari, Dr. Gitiika Bhasin*

*Mentee - Shraddha Bathla, Nitika, Pramita, Leesha, Meeshika*

### **"An Overview on Corona Virus Disease (COVID-19 Pandemic)- Environmental and Climatic Changes During Nation Wide Lockdown."**

*Mentor - Dr. Ramesh Kumari*

*Mentee - Sapna, Parushini Singh, Sakshi*

### **"Bringing Lab to Our Home: Bio-enzyme and its Multiutility in Everyday Life"**

*Mentor - Dr. Swarndeep Kaur Sethi, Dr. Kiran Soni, Dr. Gita Batra Narula*

*Mentee - Anjali Sharma, Ayesha Rehman, Himanshi Choudhary, Priyansha Jain, Versha Choudhary*

### **"Phytochemical Analysis of Selected Indian Medicinal Plants to Know the Antiviral Potential Against Novel Coronavirus"**

*Mentor - Dr. Ramesh Kumari, Dr. Navneet Kumar, Dr. Kiran Soni*

*Mentee - Riya Nimbekar, Shreya, Sakshi, Rupa, Kajal, Sakshi Maan, Diksha*

### **"Computational Study of Homo Chirality and Hetero Chirality and Different Drugs Interaction in Biological System Towards COVID-19"**

*Mentor - Dr. Kiran Soni, Dr. Gita Batra Narula, Dr. Shivalika Sharma*

*Mentee - Keti Singh, Nishita, Aditi Govind Singh, Khushboo, Kajal*

Published in "International Research Journal of Engineering and Technology", (2021)Vol- 08, Issue-03 p-2119.

### **"Nano Scale Perspective of Corona Viruses"**

*Mentor - Dr. Gazala Ruhi, Dr. Hema Bhandari*

*Mentee - Stuti Dureja, Aditi Singh, Muskaan, Harshita Sharama, Sakshi Sharma*



# Remembering the Pioneers of Department



*Late Ms. Radha Sai Ram*

Ms. Radha was the one who established the Department of Chemistry. She played an active and important role in designing the laboratories. She was elected as the secretary of the Staff Council and served the college efficiently and effectively. Radha Sairam Chemical Society was established in 1992 in memory of Ms. Radha Sairam. It has student representation from all the three years as President, Vice President, Treasurers and Secretaries.



*Late Dr. Rafia Nuzhat Rizvi*

Dr. Rafia was an inspirer, a guide, a mentor and the life of any room! Her life story is nothing short of inspirational. She graduated from Aligarh Muslim University with a Masters degree in Chemistry and went onto publish her doctorate in Organic Chemistry. Students would describe her as being charming, perfectionist, disciplinarian and hard taskmaster. She expected greatness, creativity and critical thinking from her students and led them by example. Her strength lay in her ever positive attitude towards life and the desire to fight every obstacle in spite of her health constraints, with a smile. As a mark of respect to her, the department has been organizing Dr. Rafia Memorial Lecture every year.



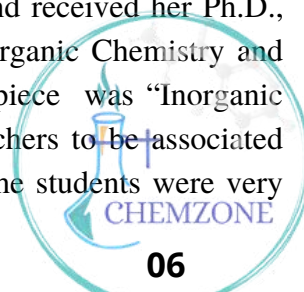
*Late Dr. Sulekha Dogra*

Dr. Sulekha was a fervent believer in strong and independent women being a backbone of a cultured society. She believed that education was the backbone of it all thus she made it her life's work. She received her Bachelors and Masters in Chemistry from Lucknow University, where she was the topper and Gold Medalist. She was granted PhD in Natural Products Synthesis. She joined Maitreyi College to start her teaching career as a Lecturer of Organic Chemistry in 1972. When the college acquired its new building in Chanakyapuri, she was instrumental in designing of the Chemistry laboratories. She retired from the Maitreyi college as Associate Professor of Chemistry.



*Dr. Shanti Kesavan*

Dr. Shanti was one of the pioneers of our Chemistry department who made enormous contribution towards the development of the Department. She did her Post graduation from Annamalai University, Tamil Nadu and received her Ph.D., degree from University of Delhi. She was an expert in Inorganic Chemistry and used to adopt innovative ways in her teaching. Her masterpiece was "Inorganic Qualitative Analysis of Ions". It was a pleasure for all teachers to be associated with her in practical classes. She was a great teacher and the students were very fond of her.



*Carrying Forward the Legacy*



*Meethi  
Yaadein*





# DR. AMIRTHA ANAND



My experience of 33 years with our Chemistry Department was wonderful. The guidance and the learning from my seniors, Mrs. Radha Sairam, Dr. Sulekha Dogra, Dr. Shanthi Kesavan and Dr. Rafia Rizvi, right from the first day of my joining, paved the way for my journey till retirement. They taught me to be disciplined, punctual and dedicated towards the work. My contemporaries and junior teachers were friendly and supportive. There were arguments during the departmental meetings but they always were healthy and led to the welfare and benefits of the students.



In my earlier years, we strictly focused only on the academic work and I enjoyed that with the support of my colleagues, lab staff and dear students. I vividly remember the days when I, Shobha and Pinkey used to run from pillar to post to meet and discuss with the experts in IIT, IARI- PUSA, CPCB, JNU and DU regarding the environmental chemistry papers, both theory and practical. Though it was a hard time, we enjoyed working collectively and responsibly especially in standardizing the experiments.



I always remember the time when we had organized a National Seminar in 2004, the first time in our department. Shanthi, Ramesh, and I used to spend long hours on many days discussing, writing matters for folders and souvenirs, and reading the proof, etc. That was a wonderful time when we had so much fun and laughter.



It was a nice experience when we had arranged an alumni function and lunch in our department. The former students including those from abroad shared their nostalgic memories about our department. I and Gita had a good time collecting the details about our alumni and preparing a directory. In fact, this exercise was helpful when the alumni association of the College was revamped. I just cannot forget our practical exam sessions. Apart from the hectic work prior to and on the days of our respective exams, we had a whole fanfare with sumptuous lunch sessions, with each one of us bringing the special items. I remember the external examiners specially the male teachers saying that the Maitreyi College Chemistry department is the best one in providing tasty food and hospitality. Even our men folk at home used to say that they get nice and varieties of food only during our practical exams (as if we do not cook nice food on other days). The participation of our lab staff those days were exemplary.

My experience with the lab staff started when Ranjit came to my home to tell me that I was asked to come and meet the teacher in charge. This is how I got my appointment here. This is my first and last college that I worked in Delhi. Working with Rameshwar Dayal was an experience in itself. Such a dedicated person, highly disciplined and strict. During my headships, I have spent a lot of time in sorting out the quarrels between him and other lab staff. He was giving only the bare minimum quantities of the chemicals to various labs and never gave even a little more. So, the senior lab assistants, in charge of labs had to argue with him. Rameshwar Dayal treated the department as his home and was very judicial in spending money or chemicals even though they are not his own. All the lab staff were co-operative to me. I would have offended them on many occasions regarding their work but they never took it to heart and they obeyed me. Although I had cordial relationship with all, it was special with those who were working in the department when I joined- Rameshwar Dayal, Hari Dass, Ranjit, Hansraj, Vinod and Jagdish.

My experience with each and every batch of students was memorable. I found that the students always maintained a distance from me. But after completing the course and leaving the College, many keep in touch with me even today. They keep sending new year and teacher's day greetings without fail. It touches my heart. I feel that I am fortunate to have the students of even 80's and 90's who love and respect me till today.

I cherish many more experiences and memories regarding our College and the Department. Though I would like to pen down all, it would be seamless and require a lot of space in the magazine. So, I stop here.





# DR. LATA NOHRIA

Her roots in academics go back to her years in Punjab where she completed her graduation, post-graduation and M. Phil. Beyond academics, She pursued her interests in languages through various courses in French & Punjabi. She further went on to groom her interests in music through formal training a diploma in vocal & instrumental music at the Prayag Sangeet Smiti, Allahabad. She worked for over 13 years in various colleges in Punjab and in 1995 she joined the family of Maitreyi College. Since then, she was an integral part of the faculty, where she dedicated herself to all activities related to teaching. She was enthusiastically involved & contributed to other extra-curricular activities at the college like NCC, student union, dramatics, beauty pageants, rangoli etc.



She was an active member of college union for many years and served as a convener of the canteen committee, ushering in quite a few improvements. She has over the years, many a times been one of the panel judges of the most celebrated event, "The Miss Maitreyi Peagent". These are just some of her contributions and accomplishments, among the many. She retired in September 2019.







## VIRTUAL FRESHERS' DAY

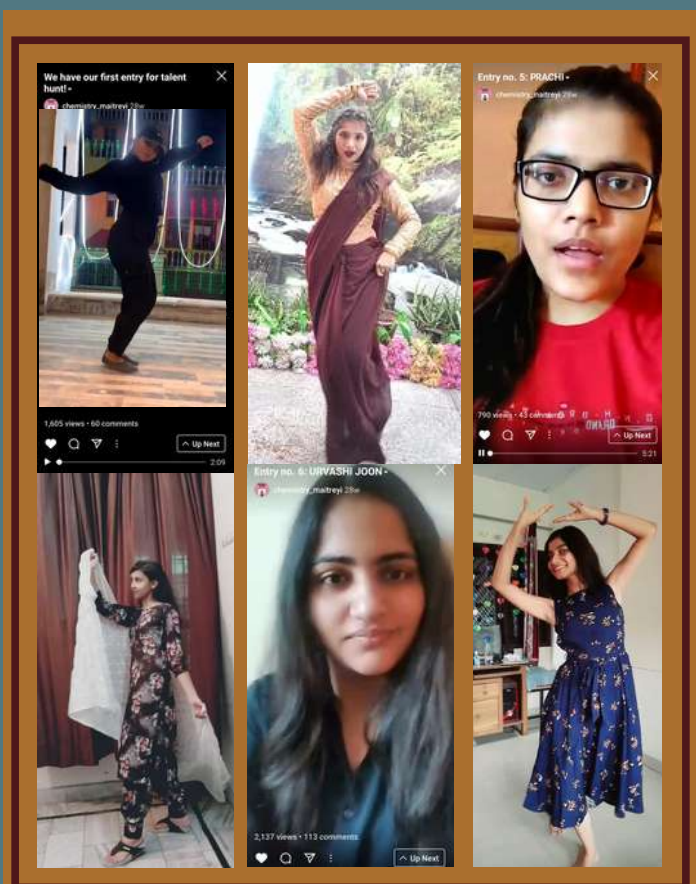
On November 19, 2020, a freshers party was organized by The Radha Sairam Chemical Society of the Department. It started with lamp lighting and then a general introduction and interaction with the college staff succeeded by a welcome message by our honorable Principal Madam and the senior faculty members. Virtual games, Miss Fresher's Competition and fun elements were arranged to make the event memorable and enjoyable for the freshers. The party ended on a happy note and blessings of all the teachers and seniors.

## IUPAC GLOBAL WOMEN'S BREAKFAST DAY EVENT



**Dr. Lakshmi Ragupathy**

On February 9 2021, An International webinar "The IUPAC Global Women Breakfast Day" was organized by the Department. Dr Lakshmi Ragupathy, former Director Ministry of Environment and Forest, delivered talk on "Environmentally Sound Management of Wastes". Students and Teachers were cordially invited to attend this webinar. The talk session was followed by a competition, "Trash to Treasure". Students presented their artistic and scientific perspective to transform trash and waste into reusable ecofriendly materials. The event witnessed more than 100 student registrations. Among them, 37 students participated in the competition. Cash prizes were given to the winners of the competition.



Glimpses of Miss Fresher's Competition

 [chemistry\\_maitreyi](#)  
Tap to see more

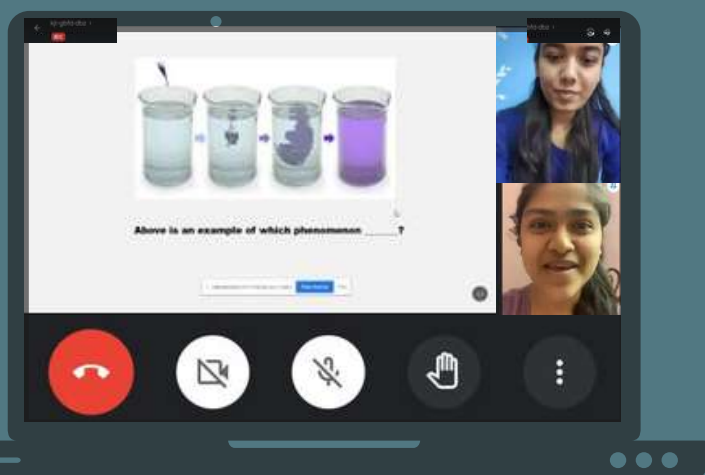




# CHEMSOPHY-2021

## ANNUAL CHEMISTRY FEST

Chemsophy-2021, the Chemistry Departmental fest was organized at virtual platform on February 18 & 19, 2021. Various events were scheduled in this fest, like Quiz Competition, Virtual Lab Fun, Paper and Poster Presentations. Around 100 students were present during the Inauguration Ceremony. Around 130 students have participated in various events (24 in poster presentation, 9 in paper presentation, 24 in Quiz, 75 in virtual lab fun). The topics of the presentation and poster covered diverse areas, like Green Computing, Sustainable Development, Pythagoras, Living with the Virus; The way forward, Role of Chemistry in the Present Scenario. The events have enriched presentation skills, critical thinking, systematic approach towards studying a problem, ability to look for viable solutions etc. among the students.



# NATIONAL SCIENCE DAY

## CELEBRATION



## Glimpses of National Science Day Poster Making Competition

National Science Day is celebrated on February 28 every year to commemorate the discovery of the Raman Effect and to pay tribute to Sir CV Raman, the first Indian Nobel Laureate in science. The Radha Sairam Chemical Society celebrated this historic day by organising an "Article/Slogan/ Poster Competition" on the theme "Chemistry in Everyday Life". The event was held in online mode and the participants were required to submit their entries within a stipulated time period on a google form. The event was a great success with zealous participation from students of various colleges and disciplines.



## Virtual Chemsophy-2021



# INTERNATIONAL WOMEN'S DAY CELEBRATION



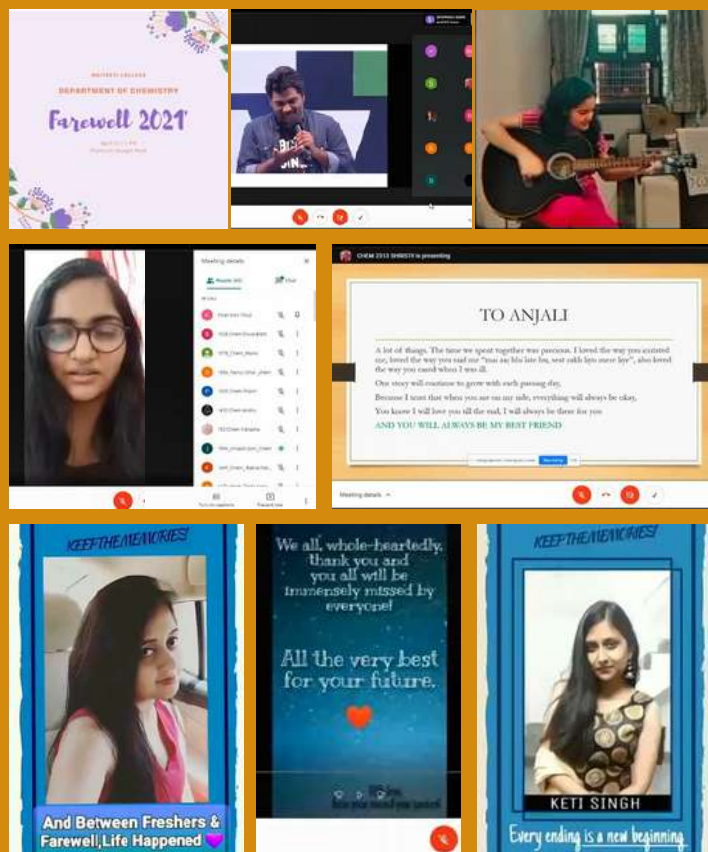
Every year, International Women's Day (IWD) is celebrated on March 8 to commemorate the political, cultural and socio-economic achievements of women in past and present, throughout the world. IWD also brings attention to issues such as gender equality and violence against women and plays a key role in the women's rights movement. The official IWD 2021 UN theme was "Women in leadership: Achieving an equal future in a COVID-19 world". To mark the occasion, Radha Sairam Chemical Society organized a competition by inviting powerful, inspiring and motivational quotes on women. The quotes were to be submitted on google form within a specified time period and the word limit was restricted to 100. The event was celebrated with much splendor with huge participation coming from students of all disciplines from various colleges.

Image Source:

<https://images.app.goo.gl/koEo6VLq8nhra4G78>

# FAREWELL OF 2021 BATCH

On April 24, 2021, a virtual farewell was organized for the graduating batch over the google meet platform. It was much fun including self-written poetry recitation by the juniors, dance performances, special video messages and various games to make the day memorable for the graduating batch. The farewell ended with the blessings of all the teachers and with teary but happy eyes. "The goodbyes to old journeys are important to welcome ourselves to the new journeys ahead. Our memories of yesterday will last a lifetime. We will take the best, forget the rest and someday will find that these are the best of times". It's always hard to say goodbyes, but this one will lead to great achievements in the life.



Glimpses of Farewell-2021





# Reminiscences of 2020

## CHEMSOPHY



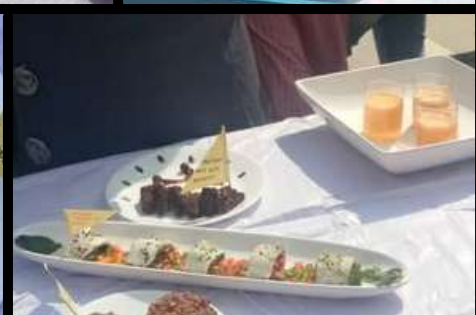


# RAFIA MEMORIAL LECTURE





# THE GOURMET COMPETITION



## *Teacher as an Educator*

### *Teacher as an Artist*

The Chef Competition organized by the Chemistry Department was an absolutely fun filled day. It was an opportunity to see the culinary skills of the teachers. The displayed recipes were a perfect amalgamation of flavor, texture, taste, nutrition and novelty in presentation. It was a delight to see that the hands which are perfect in demonstrating experiments, are equally quintessential in showing the gourmet skills. This beautiful event witnessed the participation of the faculty members of different departments.



# INDUSTRIAL VISITS

## NATIONAL THERMAL POWER CORPORATION, DADRI





# INDUSTRIAL VISITS

## WASTE WATER TREATMENT PLANT, SONIA VIHAR





# LABORATORY VISIT

CSIR-NATIONAL PHYSICAL LABORATORY, NEW DELHI



# STUDENTS' ACHIEVEMENTS

## JAM RANK HOLDERS 2020 & 2021



Shivangi Saini, 2021 Batch  
238 Rank

Shreyasi Majumdar, 2020 Batch  
IIT Roorkee



Komal, 2020 Batch  
IIT Roorkee

Anita Meena, 2020 Batch  
IIT Delhi



Kavita Meena, 2020 Batch  
IIT Delhi

Ishika Agarwal, 2020 Batch  
IIT Madras



Arushi Rawat, 2020 Batch  
IIT Hyderabad





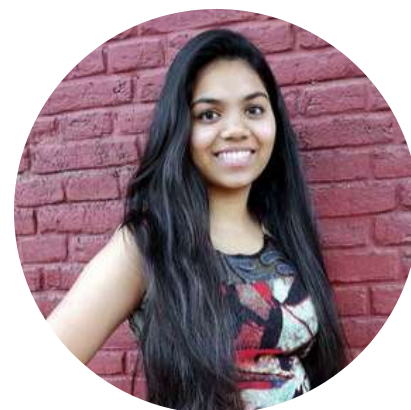
# STUDENTS' ACHIEVEMENTS

## ACADEMIC EXCELLENCE AWARD WINNERS



Yamini Chadha, III Year/VI Semester  
(9.541 CGPA)

Muskaan, II Year/VI Semester (8.92  
CGPA)



Janasthuty D, I Year/II Semester (9.68  
CGPA)





# STUDENTS' ACHIEVEMENTS

## COMPETITIONS AND CONFERENCES



Riya Nimbekar, II Year

3rd Prize, Design slide - Case study Competition,  
Avgaahan, 2021 Interdisciplinary Academic Fest



Stuti Dureja, III Year



Aditi Singh, III Year

Best Oral Presentation  
International Interdisciplinary - Conference on  
"Sustainable Future For Humanity: The New Learning Curve"



Harshita Sharma  
III year



Muskaan  
III Year



Aditi Singh  
III Year



Sakshi Sharma  
III Year



Stuti Dureja  
III Year

2nd Prize, Summer Internship Programme  
(2019-20)  
Centre for Research, Maitreyi College



# Teachers' Section



# Chemistry of Faux Caviar



## Molecular Gastronomy

By- Dr. Gazala Ruhi

Where there is a passion to **cook**; there is way to artistically manipulate the texture and flavors of food by applying basic science. **Molecular Gastronomy** is a branch of food science that offers limitless opportunities to explore the culinary field from the perspective of chemistry and physics. This includes designing of recipes with techniques like Cryotherapy (using liquid nitrogen at  $-196^{\circ}\text{C}$ ), bubbling cauldron effect, spherification (surface tension phenomena), foaming, frothing etc. and using non conventional gelling agents and thickening products.

**Fruit caviar or Faux Caviar** is one of the most popular and easy to design recipes in molecular gastronomy. The liquid fruit juices are allowed to obtain caviar like texture (juice filled pearls) using spherification technique. In this technique, thin membrane semisolid sphereshaving burst in the mouth effect is achieved with the liquids. The two approaches are **direct** and **reverse spherification**.

In direct spherification, the fruit juice containing sodium alginate/gellan gum is added drop wise in the water containing calcium chloride or calcium lactate. This results in the formation of calcium induced thin gel layer encasing the liquid phase. In reverse spherification, the soluble calcium salt is dripped into the settling bath of fruit juice and sodium alginate mixture. The drops acquire spherical shape because of **surface tension** and the spheres are stabilized by instantaneous formation of gelatinous shell of calcium alginate (drop impact gelation process). **Sodium alginate** and soluble **Calcium salts** are the two basic components of this technique.

**Chemistry of Spherification:** One of the precursors, Sodium alginate is a sodium salt form of alginic acid; a water soluble natural polymer having repetition of two monomer units, (1.4)- $\beta$ -D-mannuronate and (1.4)- $\alpha$ -L-guluronate. Alginate is extracted from brown algae and is a prevalently used material in food and pharmaceutical industry. This biodegradable polymer has the ability to form gel when comes in contact with divalent cations, like  $\text{Ba}^{2+}$ ,  $\text{Ca}^{2+}$  etc. The formed gel is basically due to the cross linking of the polymer chain with divalent cations resulting into the formation of an extended network. The gelatinous film around the spherical liquid droplets to give the Caviar like texture is due to the occurrence of this process.

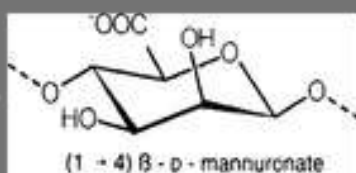


Mango caviar

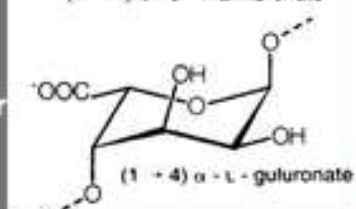


Beetroot caviar

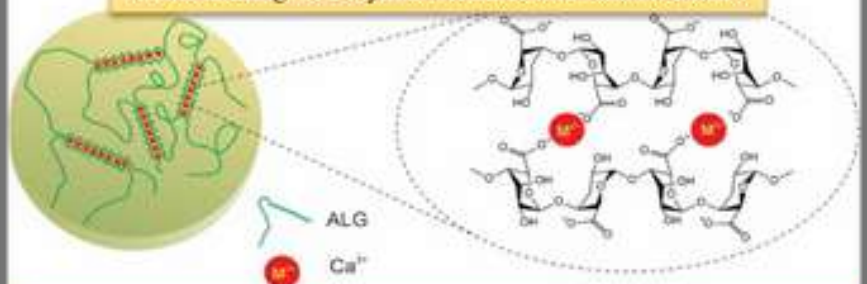
Monomer Unit M



Monomer Unit G



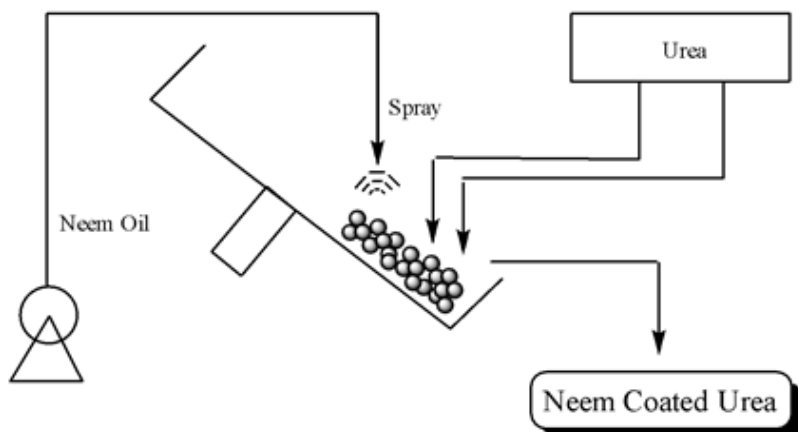
Cross linking of Polymer chain and divalent cations



Abasalizadeh et al. Journal of Biological Engineering (2020) 14:8



# Controlled Release Advanced Agricultural Formulations



**Dr. Lata Vodwal**

## The schematic diagram for the manufacture of Neem Coated Urea

A fertilizer is a chemical that is applied to the soil to furnish the necessary nutrients for the growth and development of plants. Primarily, nitrogen (N) is identified as the most significant element. About 50-70% of N applied to the soil as a conventional source of fertilizers. It is slowly released to the soil and simultaneously the leaching process started as a result the nitrogen utilization efficiency (NUE) by plants found very low. The leaching of nutrients happens due to the highly water-soluble nitrates. The efficacy of the supply of plant nutrients in a controller pattern gradually raises the nutrient utilization efficiency (NUE). It also reduces environmental problems as the maintained nutrient supply is matched with demand of the plant. So it is very important to improve the formulation of the fertilizers to supply nutrients for the proper plant growth. Controlled release agricultural formulations have long been recognized as the best solution to the traditional formulations. With the implementation of slow-release fertilizers (SRFs), the amount of fertilizer required has been drastically reduced. Apart from this, fertilizer use proficiency is significantly improved and residual impact on environmental has also become insignificance.

In view of this, the neem coated urea (NCU) fertilizer formulation is found to be one of the best alternatives to supply the adequate nutrients without raising any environmental concerns. In the NCU formulation, neem oil is coated over the surface of urea granules. As a result of this, it becomes less available to water and also allows its slow release facilitating plants to gain more nutrients. It also improves the overall yield of the crops. Researchers have observed that neem (neem oil) serves as a nitrification inhibitor and also acts as a botanical insecticide. They have reported the application of Nitrogen nutrient on Wheat and Paddy crops as a supplement and observed an exponential increase in the yield at commercial level. The NCU also enhances the absorption of Nitrogen, Phosphorus, and Potassium. Furthermore, it reduces the Nitrogen loss by more than 50-60%. Researchers studied the plant's growth parameters such as a number of branches plant height, and dry weight; found an increase by 50% more along with a rise of 16-20% in the overall production.

Looking at significant outcomes of NCU and its recognition by the agricultures, the Government of India makes numerous policies and also provides the subsidy on neem coated urea to make it more popularized amongst the farmers. In July 2004, National Fertilizers Limited (NFL) became the first company permitted to produce and market NCU in India. The Department of Fertilizer (DOF) made it mandatory for all indigenous producers of urea to produce 75 % of their production as NCU in March 2015. A response in Lok Sabha in January 2018 states that DOF has made it mandatory for all the indigenous producers of urea to produce 100% of their total production of subsidized urea as Neem Coated Urea (NCU).



# New Aged Photocatalysts for Environmental Remediation

Water pollution has become one of the major concerns around the world. Presence of various pollutants such as heavy metals, dyes and pesticides in water have become a severe environmental and public health problem, since the accumulation of these non-biodegradable heavy metals in human body cause severe diseases. Therefore, it is necessary to remove these pollutants from the contaminated water prior to its discharge to the environment to protect the aquatic lives and human being. A large number of strategies are available to remove the organic /inorganic pollutants from wastewater such as ion exchange, solvent extraction, physical and chemical precipitation, cyanide treatment, reverse osmosis, membrane filtration, electrochemical precipitation and adsorption processes etc. Most of these existing pollutants removal technologies are imperfect due to their high cost and complicated procedure. It has become required to develop new technologies using widely available low cost materials for the removal of heavy metal ions.

Among these techniques photocatalysis is one of the most efficient method for wastewater treatment. This method effectively degrades organic or inorganic pollutants using low-cost photocatalytic materials that can be modified to utilize inexhaustible solar light to further increase the degradation process. Photo catalysis is found to be one of the most effective, feasible and green technique for water treatment which includes degradation of persistent organic/inorganic pollutants in water and convert them into non-hazardous compounds. In the recent years graphene nanocomposites based photocatalysts become a potential material for environmental remediation due to its unique 2D structure, graphene is used as the support to increase the specific surface area of the photocatalyst, incorporation of semiconductors in graphene matrix could enhance the performance of photo catalysts by increasing the charge

By-

*Dr. Hema Bhandari*



separation and inhibit the recombination of photo generated electron and hole pairs. The optical and electrical properties of graphene are enhanced by preparation of its composites with metal/metal oxide and polymers which exhibit suppressed electron-hole-pair recombination rates and diminish energy gaps due to valence band level and conduction band level modifications, leading to the better absorption of light radiation and enhancement in the photocatalytic performance of nanocomposites.

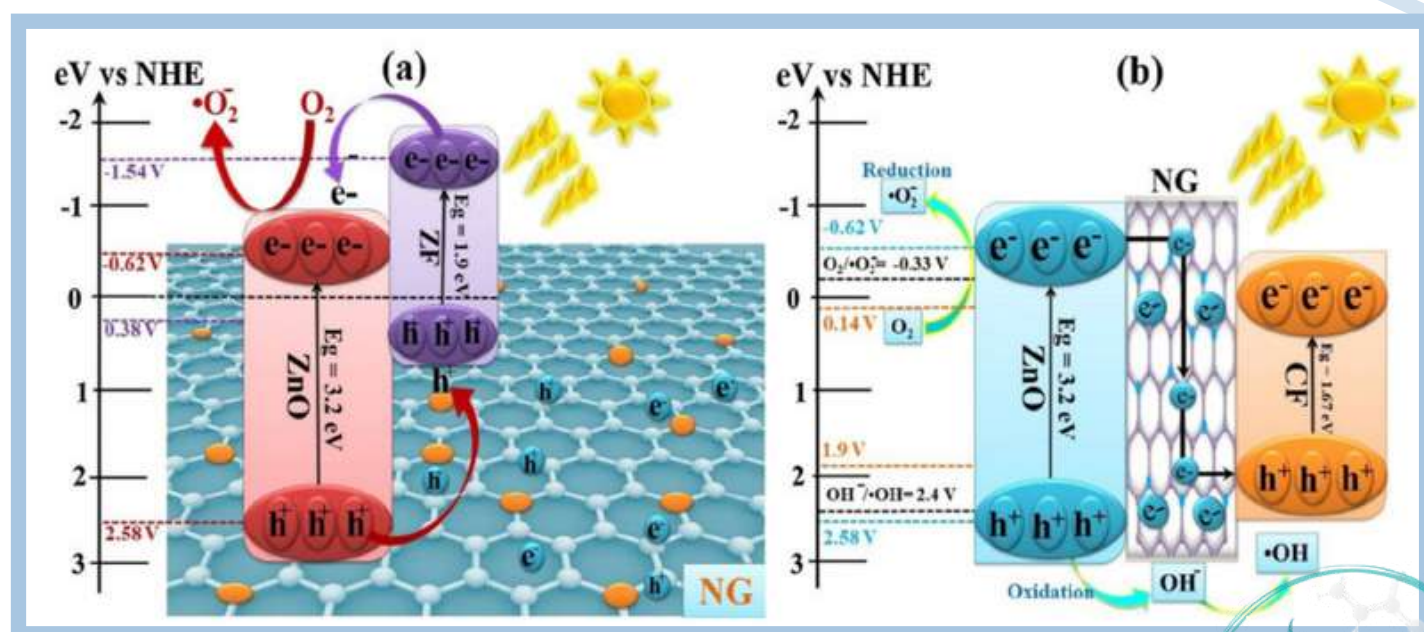




Recently Chandu and coworkers [Chandu, B, Kurmarayuni, CM, Kurapati, S et al. (2020) Carbon Lett. 30:, 225.] reported reduced graphene oxide sheets decorated with silver nanoparticles using custard apple leaf which showed remarkable photocatalytic performance upto 96% for methylene blue in 2 h under sunlight. Nanocomposites based on graphene with different metal oxide such as TiO<sub>2</sub>, ZnO, Fe<sub>2</sub>O<sub>3</sub>, V<sub>2</sub>O<sub>5</sub>, ZrO<sub>2</sub> and CuO have been found to be most efficient materials for degradation of various dyes and other organic pollutants from contaminant water .

Similarly, nitrogen doped graphene based ZnO/ZnFe<sub>2</sub>O<sub>4</sub> and ZnO/CoFe<sub>2</sub>O<sub>4</sub> photocatalysts were developed by Chandel et al. in 2020. The materials showed superior photocatalytic performance and recyclability for toxic dyes such as methyl orange and malachite green. The mechanistic view of photocatalytic degradation of pollutants using these nanocomposites is represented in the Figure. Under visible-light irradiation, mixed metal oxide (ZnFe<sub>2</sub>O<sub>4</sub>) becomes excited which leads to generation of electrons and holes, while another metal oxide such as ZnO cannot be excited due to the wide band gap. Hence, part of the photogenerated electrons in the conduction band of mixed metal

oxide (ZnFe<sub>2</sub>O<sub>4</sub>) transfer to the conduction band of ZnO since the conduction band potential of ZnFe<sub>2</sub>O<sub>4</sub> (-1.54 eV) is more negative than that of ZnO (-0.31 eV). The other part of the photogenerated electrons quickly transfer to the surface of rGO due to the ultra-high electron mobility that rGO has and this process significantly inhibits the rapid recombination of photogenerated electrons and holes in ZnFe<sub>2</sub>O<sub>4</sub>. Hence, ternary nanocomposites based on ZnO/ZF/NG and ZnO/CF/NG showed higher photocatalytic performance for degradation of toxic dyes by generating reactive species such as electrons, holes, hydroxyl radicals and superoxides as indicated in Figure. Additionally, use of conducting polymers such as polyaniline and polypyrrole in graphene offer enhanced photocatalytic performance. Moreover, nanocomposites based on graphene oxide modified with biodegradable and nontoxic biopolymers such as chitosan and cellulose hybrid nanomaterials were exhibited enhanced the adsorption ability for the contaminants. This study demonstrates that graphene-based nanocomposites are very promising candidate for development of high performance photocatalysts for environmental remediation.



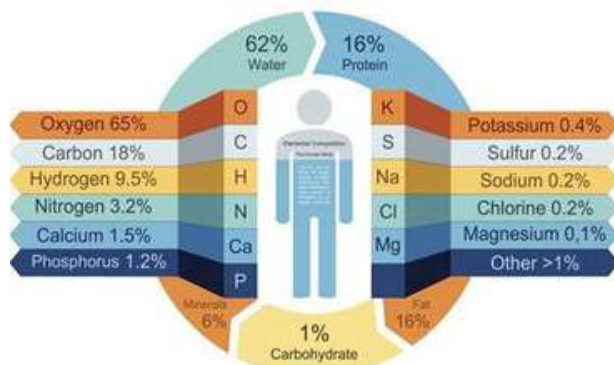
**Figure Proposed Mechanism of photocatalytic degradation of pollutants using (a) ZnO/ZF/NG and (b) ZnO/CF/NG nanocomposites. Chandel et al. (2020)**

# Chemistry in Human lives

By- Dr. Durgesh Rawat



**Elements in human body:** We find Chemistry in our daily life. Chemistry is the branch of Science which deals with the properties and changes of matter. The air that we breathe comprises of Chemistry as it contains oxygen and various other gases.



**Chemicals of food in day to day life:** The second most crucial necessity of human life is food. Now it is the invention of Chemistry that we have artificial preservatives which prevents the food from spoiling from micro organisms. Not only this but with the help of it one can cook food by making desirable changes in the recipes.



**Chemistry in Medicine:** It is helpful in improving global healthcare from basic research which helps in understanding mechanisms underlying diseases and accordingly medicines are made.



**Power of Chemistry at home:** There is no such place other than our very homes if we want to see the power of Chemistry. Having said that refrigerators, microwaves, television, washing machines, kitchen appliances are all results of Chemistry.

In the end it wont be wrong if I say that our existence is very much based on Chemistry. It has a huge role to play in every single aspect of our lives be it our homes, food, medicines, textiles, space and there is a never ending list.

Image source: <https://chemistry.gsu.edu/organicmedicinal-chemistry/> ,  
<https://www.thoughtco.com/elements-in-the-human-body-p2-602188>





# THE REMARKABLE ANCIENT INDIAN CHEMISTRY

*By- Dr. Ramesh Kumari*



**Iron Pillar in Qutub complex**

Chemistry is the study of matter present in Universe. This is an experimental science which deals with understanding on preparation, properties, reactivity, and applications of pure metals and organic compounds in natural and synthetic form. Chemistry in Indian context has been termed as Rasayan Sastra in Sanskrit. The very old study of the conversion of Basic substance to some new form was known as Alchemy. The highlights of the realizations of our incredible contribution is evident from the literary work and archeological excavation work of our nation. Vaiseshika Darshana of Kanada promulgated the concept of Anu (Atom) and its indivisibility and the law of cause and effect.

The use of metals like Gold, Silver, Copper, Tin, Lead, and Iron were known by the Vedic people. These metals were used in that society for agriculture, house hold work, and trading. Artha sastra describes the qualities of gold and silver. The colour was taken as the criteria for quality and purity in olden time. Gold which is of lotus petal color, soft lustrous and not sound producing has been stated to of best quality as compared to reddish yellow and the red coloured respectively. Similarly white coloured silver with soft and smooth properties was considered to be having the highest GUNA (Quality)

Nagarjuna has been cited as a great chemist and metallurgist. The renowned Iron Pillar inside the Qutub Minar premises, Delhi stands as a live example to affirm the outstanding, scientific and metallurgical expertise of the ancient Indian chemists. This pillar has not yet been tarnished or rusted despite it being standing bare to sun, cold, rain and extreme weather conditions from the past 1500 years. Nataraja statue, the God of dance has been made of five metals- Panch-Dhatu is also indication of the innovative smelting technology in ancient India. The regular zinc production technology by the sophisticated distillation process has been reported in the 12th century AD at Zawar in Rajasthan.



The description of Rasayan shala and the use of more than 32 instruments has been mentioned in the 7th chapter of Ras Ratna Samuchchay. Various glass products has been found in the excavation in Uttar Pradesh, Bihar, Bengal and Karnataka.

These products were rich in properties like transparency, color, smooth finish and uniform density. The chemical analysis show the presence of lime, alumina, silica, oxides of titanium and iron which are still used in modern industry. Use of various types of inks and dye have also been reported

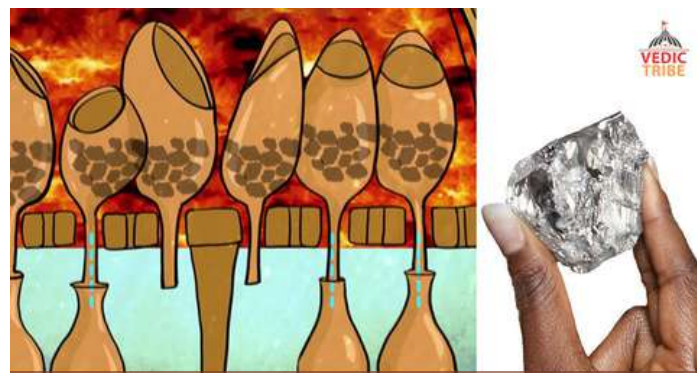
Medicinal Chemistry has been used in olden time in the form of traditional ayurvedic treatment.

Ayurvedic system of medicine is still the most olden yet prevailing practice by the use of herbs and spices. Five types of salts and 84 types of wines have been reported in Charak Samhita. Use of various chemicals like copper sulphate, cinnabar, cosmetic formulations, perfumes, essential oils has been mentioned Vagbhatt's Astangrhudaya. The use of mercury and iron in medicines shows that chemistry must have been practiced at advanced level. These are just few examples of wonderful institution of chemical sciences of ancient India.

Professor PC Ray of Calcutta is acknowledged as the father of Indian of Chemistry has spent his life for establishing Chemistry and chemical industry in India. Chemistry can be fully responsible for shaping the society by developing novel, stronger, smaller materials. The precious and ancient wisdom has enormous potential and can be used responsibly with modern science to protect and ensure sustainability in future.

Image source :

<https://images.app.goo.gl/6R3qLPqcYw94qQSR6>  
vedic tribe.com,istock.com ,Times of India.com



**Ancient India : First and only producer of zinc**



**Use of Medicinal Chemistry in Ayurveda**



**Zinc retort distillation furnaces a conserved geological marvel in Zawar, Udaipur.**





# CHEMISTRY IS A NATURAL GIFT TO FIGHT AGAINST CORONAVIRUS

BY-  
**Dr. NAVNEET  
KISHORE**



Chemistry is a word to say, but it is riveted in the entire Universe. Just as, God is present in every particle, in the same way chemistry also pervades every tiny particle. There are several elements which exist in our environment and have the ability to produce myriad compounds. Plants present in nature also make myriad of chemical substances using the elements present in the atmosphere. These chemical substances produced by plants are called phytochemicals. In the beginning, we did not know about many chemicals. We came to know about these chemicals from plants only, when these chemicals were identified from different plants. Vitamin C is an essential micronutrient for human beings and found richly in nature. It has a very important feature to prevent and treat all types of viral infections. It has strong antioxidant potential and an essential cofactor for enzymes involved in gene regulation. It strengthens the innate and adaptive immune system by supporting many cellular functions. It supports skin epithelial function by blockade of pathogens invasion and promotes scavenging activity. The accumulation of Vit-C in phagocytic cells like neutrophils with the enhancement of chemotaxis and phagocytosis as well as the generation of ROS (Reactive Oxygen Species) ultimately results to microbial killing. It is also required for the clearance of consumed neutrophils at the sites of infection by macrophages, hence desired for apoptosis. In overall it decreases the necrosis and damage of potential tissue. It played significant role to enhance differentiation and proliferation of B-and T-cells, an important effect of gene regulation. Vit-C deficiency reduces immunity and increases the risk of becoming infected. Thus, by taking

plenty of Vit-C daily, the chances of getting infected are greatly reduced.

India has been known for medicinal plants since ancient times. Many vegetables, fruits and grains produce and store Vit-C. We can take these vegetables and fruits in our daily diet to increase our immunity. All types of viral infections attack our immune system. Therefore, our immune system must be strong to avoid any kind of infection. According to medical practice the adequate amount of Vit-C is 100-200 mg per day. However, the infected persons require higher doses (in gm) of Vit-C to compensate and saturate the plasma levels. At present, the corona virus outbreak has taken an aggressive form. Which is causing millions of deaths, worldwide. Therefore, we can avoid the infection of corona virus by strengthening our immune system. The decoction of Giloy, sahjan and curry leaf prevents coronavirus infection. Some plants are known for their abundant amounts of Vit-C. Which are stated here along with the amount of Vit-C (in mg). 100 gm, amla (600), A cup guavas (376), a cup red bell pepper (190), a cup yellow peppers (152), 100 gm broccoli (132), a small cauliflower (127.7), a normal size mango (122.3), a cup green bell pepper (120), a cup chili peppers (107.8), a cup papaya (88.3), a cup Strawberries (84.7), 100 gm Pineapple (78.9), a 100 gm lemon (77), a medium size orange (69.7) and a kiwi fruits (68.6) mg delivers Vit-C. There will be no deficiency of Vit-C in our body if we include these products in our food seasonally. By doing it, immunity will remain strong and a strong immunity protects us from all viral infections. In this way we can also avoid the COVID-19 infection forever.



# NATURAL AND SYNTHETIC BINDER SYSTEMS AND THEIR INFLUENCE ON PYROTECHNIC MIXTURE

By- Dr. Rajni Johar

Halons fire extinguishing agents have been phased out given the Vienna convention (1985) and Montreal protocol (1987) on protecting the ozone layer. Aerosol generators containing aerosol-forming pyrotechnic formulations (PyFs) are presently considered an effective alternative to the halon. Conventional PyFs employ flammable synthetic resins as binders, associated with life-threatening occupational hazards. Though these synthetic organic resins have excellent adhesion and mechanical properties, their high flammability has limited their application to the non-explosive platform. The combustion flame temperature of PyFs in employing synthetic organic resins may reach upto 2100 °C and render the metal surface of those generators red hot. It may cause secondary fire risk in an explosive atmosphere, especially ship engine rooms and oil-pours and can self-ignite at 330 °C. Moreover, their manufacturing process requires volatile and flammable solvents like isopropyl alcohol, acetone, ethyl acetate, and ethyl alcohol.

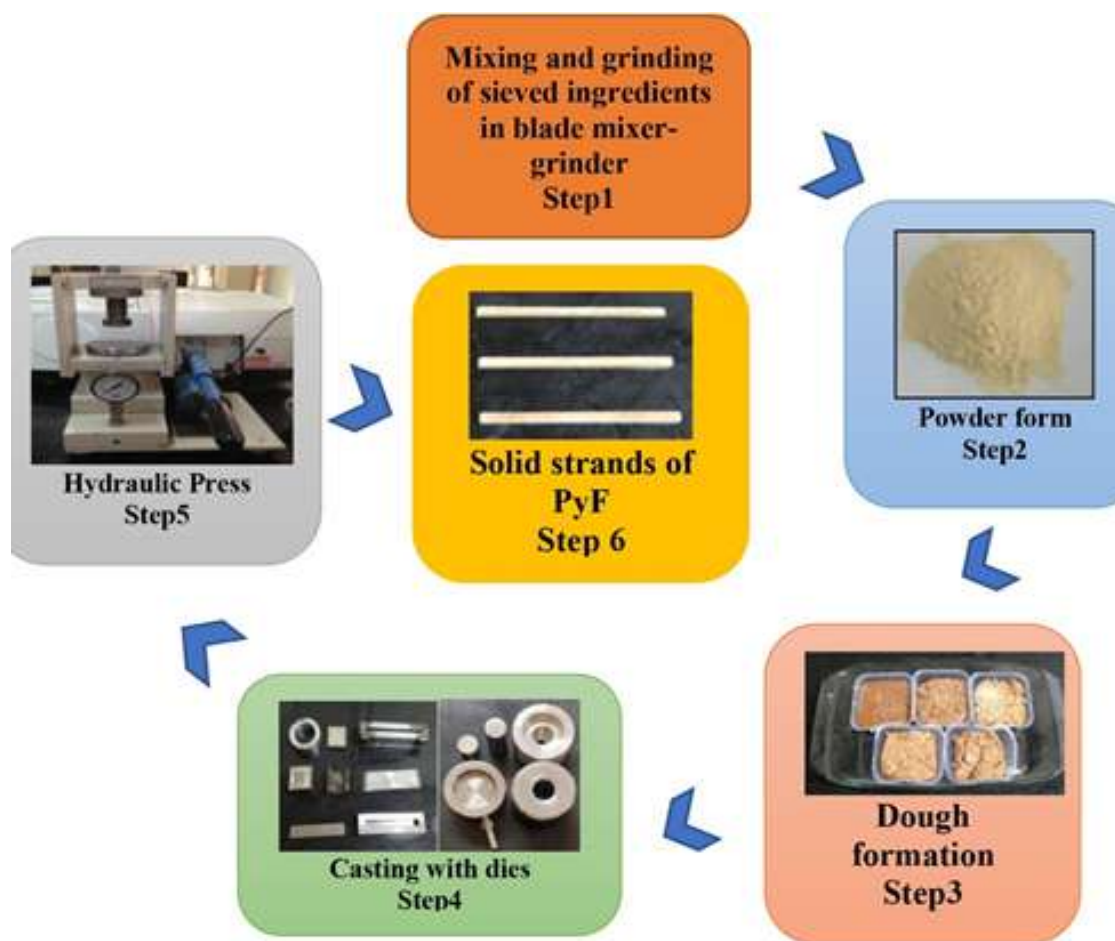
Natural antioxidants like ascorbic and gallic acid can be employed wherein on its thermal actuation, these acids undergo a rapid redox reaction with strong oxidants like a mixture of potassium chlorate and potassium nitrate to produce hot aerosol fire extinguishing agents.



During evaluation of their fire extinguishing performance and thermal characteristics against phenolic resin and potassium nitrate-based conventional PyF, it showed better fire extinguishing efficacy. Besides this, It had 67 to 76 % less combustion flame temperature, faster burn rate (13–16 mm/s), and lower calorific value (5580-6880 J/g) than conventional PyF. Thereby, they can simplify the complex structure and reduce the high cost of the aerosol generators by preventing the use of any physical cooling systems, which are generally installed at the front end of the aerosol generators to reduce the temperature of discharged aerosol and hot gases.







**Figure: Preparation of PyFs**

Conventional synthetic binders phenol-formaldehyde resin, carboxymethyl cellulose sodium salt, ethylcellulose, and hydroxyethylcellulose are being used in aerosol forming pyrotechnic formulations for firefighting application to significantly influence the fire suppression performance, thermal and mechanical characteristics of aerosol-forming pyrotechnic mixture.

Tannic acid is a natural binder that was comparatively investigated against above mentioned four different types of conventional synthetic binders. Binders generally have a significant role in the pyrotechnic mixture. Binders in PyFs consolidate the ingredients and provide a uniform solidification that inculcates excellent mechanical strength. Typically, binders increase the storage life and feasibility of ignition by improving the homogeneity of the PyF.

The rise in health and environmental safety concerns in recent years has directed researchers towards natural binder systems from renewable resources. Tannic acid is a hydrolyzable polyphenolic tannin obtained from plants. It is water-soluble and exhibits anticarcinogenic, antibacterial and antioxidant properties. Due to the presence of a number of hydrogen bonding interaction sites and aromatic rings, they induce ionic and covalent interactions, providing improved mechanical strength to the tannic acid-based pyrotechnic composites.

# Acharya Prafulla Chandra Ray

*By- Dr. Pratibha Chaudhary*

Prafulla Chandra was a synthetic Inorganic chemist with active interest in organic molecules and reactions especially to the chemistry of thio-organic compounds. His initial work which made him famous was based on the chemistry of inorganic and organic nitrites, he was regarded as “Master of Nitrites”. In 1894, P C Ray began analysis of certain rare Indian minerals. In his quest to discover some new element to fill the gaps in Mendeleev’s Periodic table. He soon reported the first ever synthesis of the previously unknown compound of Mercurous Nitrite  $\text{Hg}_2(\text{NO}_2)_2$ , which he narrates in his autobiography as “the discovery of mercurous nitrite opened a new chapter in my life”. This compound of mercury was a fascinating example of two relatively unstable ions combining to form a stable substance.

He is known as the Father of Modern Chemistry in India, who reached a high level of perfection in his times. The first Indian who started the integration process of highly advanced Ancient Indian Chemistry with Modern sciences, a researcher who led Indians towards modern Chemistry, founder of Indian Chemical Society and a Startup entrepreneur. Acharya Prafulla Chandra Ray’s book, *A History of Hindu Chemistry* is a critically acclaimed treatise on Rasashastra and Ayurveda. The first volume of the book was published in 1902, and the second in 1909. The book strongly attracted the attention of western world towards Indian alchemy and led to the globalization of the fundamentals of Rasashastra.

With an initial investment of Rs. 700, he setup India’s first pharmaceutical company, Bengal Chemicals, now known as the Bengal Chemicals and Pharmaceutical Works Ltd (BCPWL). The company is now in prominence during the Covid-19 situation, as it has been licensed by Government of India to produce the much-needed hydroxychloroquine (HCQ). In the year 2011, which was also the International Year of Chemistry, the Royal Society



UK, honored his work with the Chemical Landmark Plaque “To commemorate the life and achievements of Acharya P. C. Ray, father of Indian Chemistry, philanthropist and entrepreneur who founded modern Chemistry teaching and research in India.” This was the first-ever Landmark Plaque awarded outside Europe. The plaque was installed on 31 January 2012 at his alma matter, Presidency College, Kolkata.





# PHOTO-CATALYTIC WATER SPLITTING FOR THE GENERATION OF HYDROGEN AND OXYGEN: AN ALTERNATIVE FUEL

*By- Dr. Kiran Soni*



It is well known fact that the fossil fuels are nonrenewable and are being depleted at a fast pace. Moreover, combustion of these fossil fuels causes severe environmental pollution as well as global warming. There is international pressure through various agencies and environment treaties on every country to reduce the carbon emission.

Thus, huge research is going on for other alternate source of energy. Sun has abundant source of energy and this solar energy can be converted into other form of energy through advance technology. This solar energy can be used to generate Hydrogen and Oxygen Fuel from water.

## **Why Hydrogen and Oxygen can be used as Energy Source?**

Hydrogen is the most promising future fuel having the ideal energy source due to its highest gravimetric energy density of any known fuel. The energy density of Hydrogen is much higher than oxygen and Carbon. The major outcome by combustion of hydrogen is water which can be used again. Hence, hydrogen energy has attracted great attention as substitute energy to fossil fuels due to exhaustible and air polluting nature of the later one. Even though hydrogen is the most abundant element on earth, but it does not exist as free molecule like oxygen. Therefore, it has to be produced from hydrogen-containing resources such as natural gas, coal, biomass and water by reforming, gasification, thermal decomposition, electrolysis or photolysis. Currently, approximately 96% hydrogen is produced from fossil fuels with the substantial amount of greenhouse gases such as CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>x</sub>, CO etc. as by-product which are primarily responsible for global warming. Therefore, the sustainable production of Hydrogen fuel on an economical scale is a big challenge. In this framework, energy induced through renewable source like photoinduced electron transfer processes create an intense field of research. Elemental Hydrogen and Oxygen can be produced from water in the presence of Sunlight and catalyst. This process is known as Photocatalytic water.

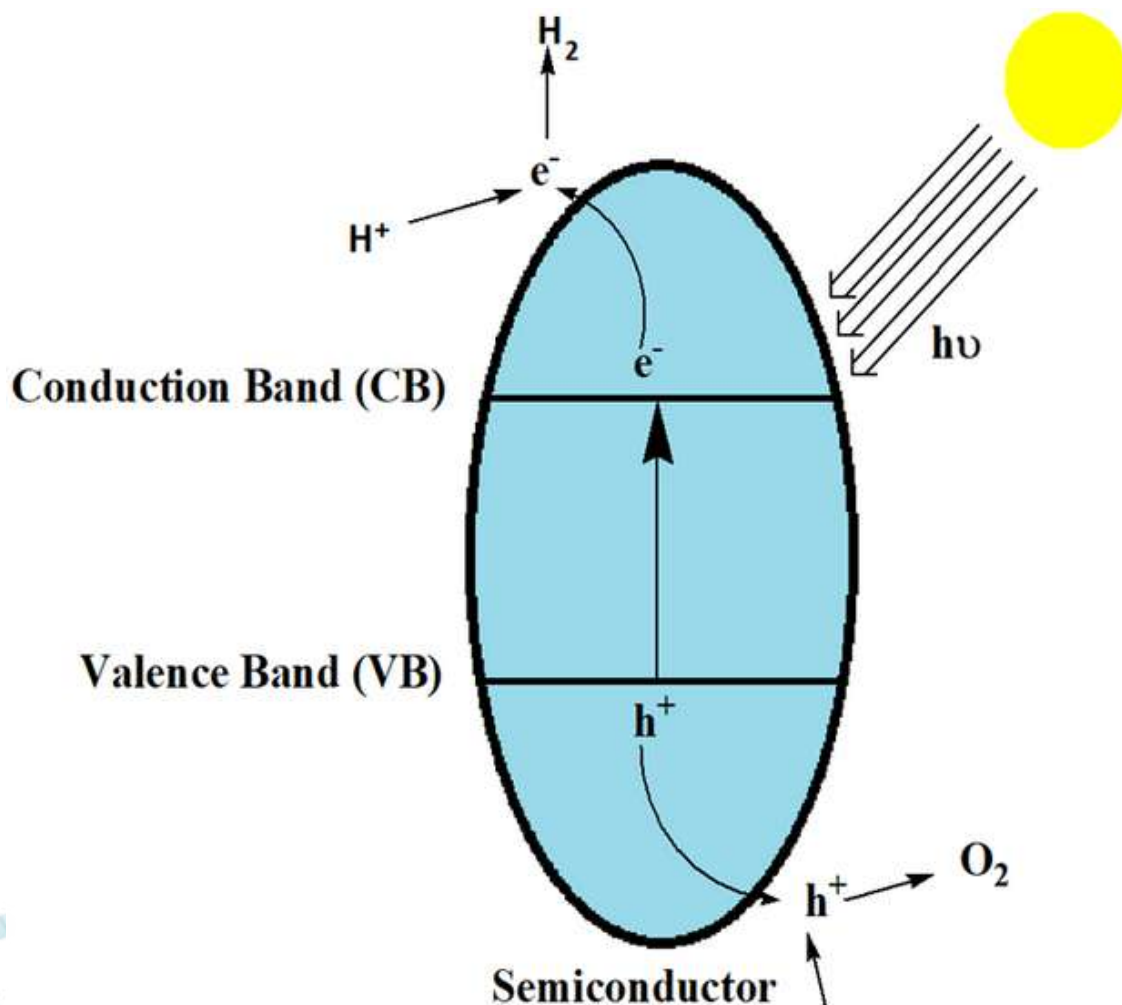
It is a process that uses photogenerated electrons from a photocatalyst to begin the light-driven splitting of water. Hydrogen and oxygen evolution occur in a stoichiometric ratio of 2:1.

## **What are the limitation in Photocatalytic Splitting of Water?**

Main limitation in photocatalytic water-splitting is the inadequate charge carrier diffusion length in the semiconductors and successive reactions of the photo energized holes and the consequent high electron-hole pair recombination rates. During heterogeneous photocatalysis, complete separation of the electron-hole pairs is quite challenging as compared to their recombination.



**Figure: Mechanism of water splitting**



### What is the need to Split water?

All of us know that 70% of earth surface is made up of water and Water is made up of Hydrogen and oxygen. Thus, the abundant source of water can be used for production of pollution free, efficient and economical Hydrogen and Oxygen fuels as an potential alternative to the fossil fuels.

### What is the mechanism of water splitting?

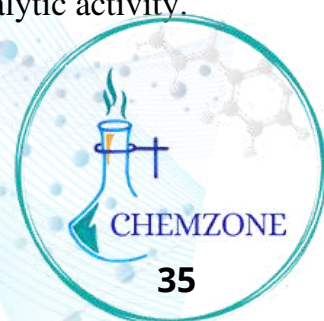
Photoelectrolysis use sunlight to decompose water into Hydrogen and Oxygen. It requires semiconductor materials which we use in photovoltaic devices. Photoelectrolysis occurs in various steps: 1) Electron-hole pair photo generation. 2) The hole decomposes the water at anode and Hydrogen ions react with electrons at cathode for the generation of Hydrogen. 3) oxygen and Hydrogen are separated through semipermeable membrane

### Future Scope

The solar energy offers potentially enormous capacity. Solar radiation of about 5,000 trillion kWh per year is incident over India's land mass. Even 10% effective utilization of solar energy can fulfill our energy requirement.

Therefore, considerable amount of research effort is required in the design of catalysts which can work efficiently under solar radiation. Careful choice of materials is required so that its band gap is  $\sim 2\text{eV}$ . It satisfies the band potential requirements. Many transition metals meet the Band gap requirement, but they are not stable in the absence of sacrificial reagents. Though most of the transition metal oxides are stable catalysts, the Valence Band and Conduction Band energy requirements for oxygen and Hydrogen evolution, make it inefficient for visible light photocatalytic reaction.

Hence, there is a need to develop a library of photocatalysts to clarify different factors influencing their photocatalytic properties. For Example, the role of different structures and shapes of the photocatalysts on the photocatalytic activity.





# FLOWING INK



# WOMEN IN CHEMISTRY



## Alice Augusta Ball

(1892-1916)

**Chemist**

"She developed The Ball Method  
which was first truly effective  
treatment for Leprosy"

Alice Ball was an African American chemist born on July 24, 1892 in Seattle, Washington. She developed the first successful treatment for people laid low with Hansen's disease (leprosy). She was the very first African American and also the primary woman to graduate with a M.Sc. degree in chemistry from the University of Hawaii. Ball was the center child with two older brothers and a younger sister. She belongs to upper middle-class family. She excelled at Seattle highschool, graduated in 1910, and went onto get multiple graduate degrees from the University of Washington and Hawaii.

Ball created the first injectable leprosy treatment using oil from the chaulmoogra, which was only a moderately successful topical agent employed in Chinese and Indian medicine. She isolated the oil into carboxylic acid components of various molecular weights allowing her to manipulate the oil into a water-soluble injectable type.

Her scientific rigor resulted into a highly successful method to alleviate leprosy symptoms, later called the "Ball Method," that was used on thousands of infected people for over thirty years until sulfone drugs were introduced.

### **Death and Discovery Credit Stolen**

Tragically, Ball died on New Year's Eve, 1916, at the young age of 24 because of inhaling chlorine gas during a lab teaching accident. Dr. Arthur Dean, continued her research without giving ball all the credit and even called her own discovery, the "Dean Method." In 1922, six years after her death, Dr. Harry T. Hollmann tried to correct this injustice. He published a paper in 1922 giving credit to Ball, calling the injectable variety of the oil the "Ball method". In 2000, the University of Hawaii-Manoa placed a bronze plaque before a chaulmoogra on campus to honour Ball's life and her important discovery. Former functionary (Lieutenant Governor of Hawaii), Mazie Hirono, also declared Feb 29 as "Alice Ball Day."

Image source: <https://scientificwomen.net/women/>

**DIKSHA**  
**BSc(H) CHEMISTRY**  
**II YEAR**







# Dorothy Hodgkin

(1910-1994)

**Chemist**

"She discovered the structures of Penicillin and Vitamin B12"

**LIFE:** Dorothy Hodgkin was a British Chemist born in Cairo, Egypt in 1910. She is known for determining the structures of Penicillin, Vitamin B12 and Insulin. She won Noble Prize in Chemistry in 1964 for determining the structures of biologically important molecules by X-ray techniques. Apart from being a scientist, she was also an activist for world peace. She had rheumatic arthritis and died in 1994 due to stroke.

**EDUCATION:**

Dorothy Hodgkin graduated in chemistry with a first-class honours degree from Somerville College, University of Oxford. She was the third woman at this institution to achieve this distinction. Later, she began studying for a PhD at Newnham College, University of Cambridge. She carried out her research work under the supervision of John Desmond Bernal, a pioneer of modern molecular biology. It was during her work when she cognized the potential of X-ray crystallography for the determination of structure of proteins. In 1934, she returned to Oxford University after receiving her PhD from Cambridge University. She remained there for the rest of her career, achieving a host of brilliant discoveries in the field of molecular biology.

**WORK:** X-ray crystallography technique is used to determine the crystal's structure. The technique was used to map large and complex molecules during the 1930s. A number of X-ray diffraction images and extensive calculations helped Dorothy Hodgkin to determine the structure of penicillin (in 1946) and the most complex structure of vitamin B12 (in 1956).

(i)PENICILLIN (1945): Hodgkin confirmed the structure of penicillin in 1945 and it was the first time in history that the structure of a whole molecule had been calculated using X-ray data. She passed X-ray waves through different penicillin salt crystals (of Na, K and Rb), and recorded and compared each of their diffraction patterns on a photographic film.

(ii)VITAMIN B12 (1955): By using X-ray crystallography, Hodgkin determined the structure of vitamin B12, for which she won a Nobel Prize. In 1955, Vitamin B12 was the most complex molecule tackled by X-ray crystallography and it had taken eight years for Hodgkin to solve this structure.

(iii)INSULIN (1969): In 1935, Hodgkin had first grown the crystals of insulin, but it was only after thirty-four years when she was finally able to determine its 3-D structure.

Image source: <https://scientificwomen.net/women/>

**RIYA NIMBEDKAR**  
**BSc (H) CHEMISTRY**  
**II YEAR**





# Stephanie kwolek

(1923-2014)

**Chemist**



"She invented poly-paraphenylene terephthalamide, which is better known as Kevlar"

Stephanie Kwolek was an American chemist and was known for inventing Kevlar. She also did an incredible invention of stopping bullets with a thread. Kwolek was awarded the DuPont company's Lavoisier Medal for her outstanding technical achievement. She was the only female employee who received that honor. In 1995 she became the fourth woman to be added to the National Inventors Hall of Fame. Kwolek won numerous awards for her work in polymer chemistry, including the National Medal of Technology, the IRI Achievement Award and the Perkin Medal. In later life used to do tutoring and was an advocate for encouraging young girls to study science.

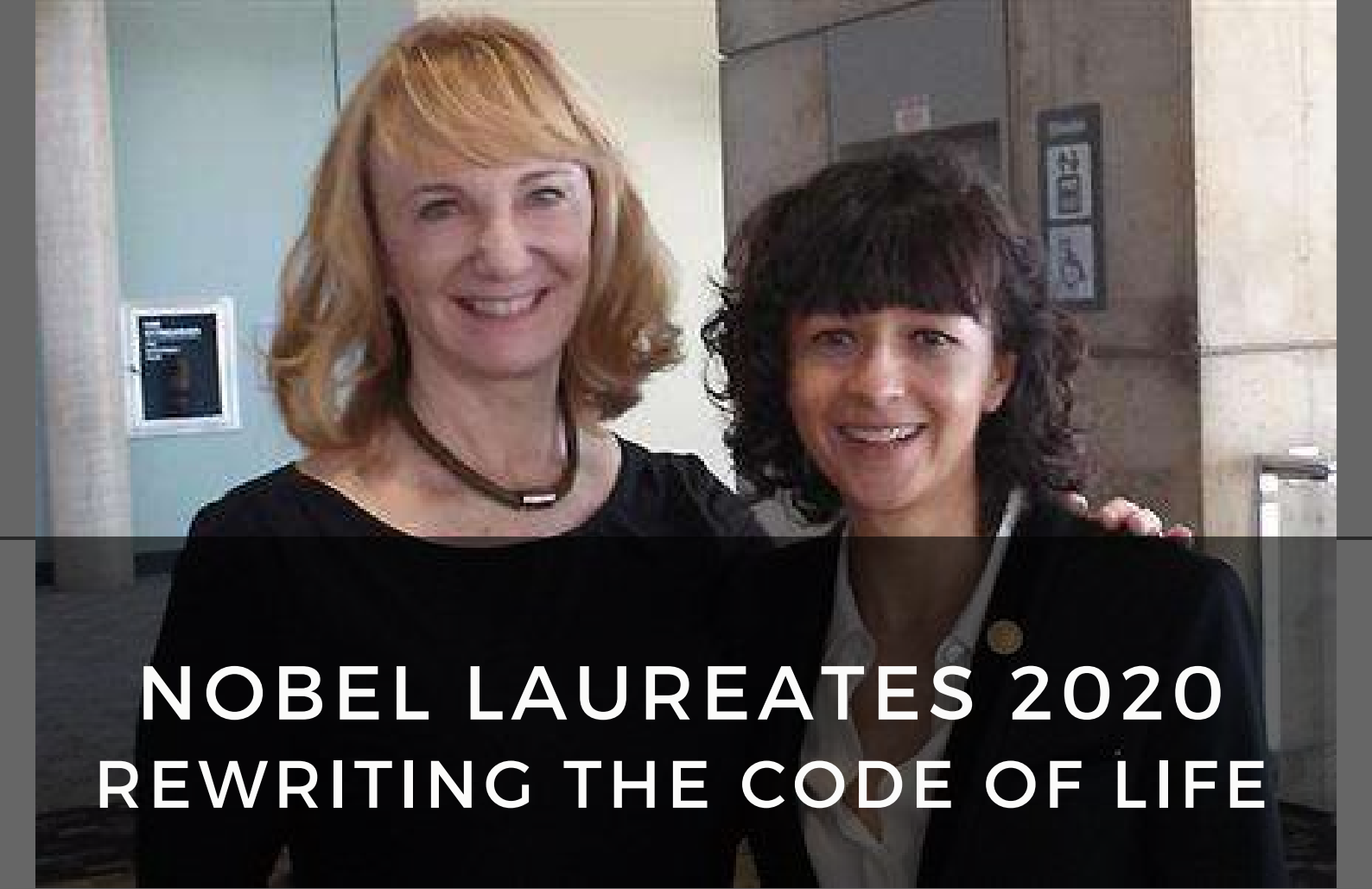
Image source: <https://scientificwomen.net/women/>

**SAKSHI**  
**BSc (H) CHEMISTRY**  
**II YEAR**

Kevlar is an excellent antiballistic (bullet- and knife-resistant) material. This is because large amount of energy is required to make a knife or a bullet pass through it. It is a strong plastic which is capable enough to stop bullets and knives. It is five times stronger than steel on an equal weight basis. It comes in two main varieties called Kevlar 29 and Kevlar 49. It has a great ability to withstand temperatures and decomposes only at about 450°C (850°F).







# NOBEL LAUREATES 2020 REWRITING THE CODE OF LIFE

How astonishing would it be if we get to know Malaria can be removed from mosquito or designer babies can be created by genetic enhancement one can get the desired colour of eyes, hair or being able to develop more effective new cancer treatments? All these fascinating things have been made possible by two-woman scientists Emmanuelle Charpentier and Jennifer A. Doudna. It is for the first time in history that the only women team were awarded Nobel Prize in 2020 in Chemistry, for their great achievement that has conferred the greatest benefit to humankind. They received their Nobel prize for the development of genome editing method. The CRISPR-Cas9 genetic scissors one of the sharpest tools in gene technology or we can say a tool for rewriting the code of life. This tool has not only revolutionised the basic science, but innovative crops can also be created which will

further lead to ground-breaking new medical treatments. This genetic scissor has contributed so much to the research field the things which were not possible earlier can be fulfilled now. The treatment for the genetically inherited diseases can also be seen now. When Emmanuelle Charpentier and Jennifer Doudna had begun their study with immune system of a Streptococcus bacterium, their idea was to develop new form of antibiotics which lead them to the discovery of molecular tool that can be used to make precise incisions in genetic material and has changed the life sciences. Both these scientists have taken mankind onto a vast horizon of unimagined potential and, along which we will the make new and unexpected discoveries. Image Source: <https://blogs.stjude.org/progress/nobel-laureate-and-crispr-cas9-genome-editing/>

**MUSKAAN**  
**B.Sc. (H) CHEMISTRY**  
**III YEAR**



# EXPOSING THE FOREVER CHEMICALS

Equipped with five senses man explores the universe around him and calls it science. Science and Technology have made our lives way easier than we could ever think. But at the same time, it has invaded our private life, running through our veins. Robert Bilott, an environmental lawyer at Taft law firm dedicated his nearly 18 precious years litigating a company named DuPont de Nemours which was dumping harmful chemical waste near the outskirts of West Virginia. Du Pont is a well-known company for producing Teflon, which is used widely in making non-stick cookware.

The chemical waste generated in producing Teflon is mainly PFOA and PFOS. PFOA is one compound in a family of compounds called PFAS (poly and per-fluorinated alkyl substances). Bilott represented Wilbur Tennant, a resident of West Virginia whose lands were used as landfills for Du Pont. In these landfills, Du Pont dumped tonnes of harmful chemical waste like PFOA, which in turn was polluting the Ohio River. About 100+ cows on his farm died due to mysterious ailments by drinking the polluted water. In 1999, Bilott came to know about the situation and filed a lawsuit against the company. In response to that, a commission reverted that his cows did not die due to drinking polluted water but because of lack of nutrition. Bilott forced the company to show the documents related to PFOA, for which they first refused but later on in 2001 agreed to give after court trials. To this, the company sent dozens of decade-old unorganized documents, which could even fill a room. Little did they know that the files which they sent had all their dark secrets printed. Bilott spent a year rearranging those and collecting pieces of evidence. Then came the real history of du Pont. The company purchased the PFOA from 3M (a company). The 3M specified regulations on how to dump water but DuPont didn't follow those and started flusing PFOA powder into the Ohio River.

The scientist of the very own du Pont conducted secret researches on animals like dogs and cats. They found that the chemical wastes which they were flushing have many harmful effects on the body. In 1984 their very own study revealed that PFOA content is present in the local water supply of Ohio. In 1991 they determined that the safe level of PFOA content in the water should be around 1 part per billion, but it has already reached six times higher. The company knew the harmful effects yet these studies were kept secret and continued dumping the waste for over a decade. 2001, Bilott sent the letter to the director of every relevant regulatory authority and handed the case file to EPA. In 2004 Du Pont agreed to settle the class-action suit and installed the filtration plants in a few of the worst affected areas. In 2005 Du Pont agreed to a 16.9-million-dollar settlement. In 2010 Bilott's health degraded due to it, he suffered from strange attacks. In December 2011 after seven years of finding, scientists proved that diseases like kidney cancer, thyroid disease, testicular cancer in residents of West Virginia have a direct link with PFOA. In 2013 an agreement was signed by Du Pont ceasing the production of PFOA. In 2016 it came out that PFOA is present in every American blood. Now EPA has set the limit of PFOA is 0.4 parts per billion. This journey of Robert Bilott started in 1999 and is going on and it has no end because there are many companies like Du Pont knowingly or unknowingly who are discharging polluted chemical waste in rivers. It was through the 18 years of finding and struggles of Robert Bilott, that made the company bound his knees and agreed to the fact that they were causing harm to people knowingly for sake of greed and capitalism. New York times article based on it- <https://nyti.ms/3uyE6X1>

**ADITI GOVIND SINGH**  
**BSc (H) CHEMISTRY**  
**III YEAR**







**Robert Bilott**

EXPOSING AND UNCOVERING THE DARK SECRET OF

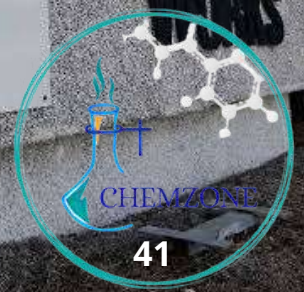
# PFAS KNOWN AS "FOREVER CHEMICALS"

which became the WORST FEAR for DuPont



# EXPOSURE

POISONED WATER, CORPORATE GREED,  
AND ONE LAWYER'S TWENTY-YEAR  
BATTLE AGAINST DUPONT







# TEFLON

## DO WE NEED TO WORRY ABOUT IT?

Remember cooking dosas omelette in a non-stick pan, quite handy and easy to use, no use of excess oil and no sticking. Simply wow! do you know how this is achieved in pans that nothing sticks in it? it is because of Teflon-(a company name) which is polytetrafluoroethylene PTFE. It is used as a non-stick coating in cookware and also in many other materials to make it waterproof. Even though if u say you've never used a Teflon-coated pan, there is still a chance that you are carrying some of Teflon's breakdown particles in your body in trace amounts because the substance has a wide range of uses outside the home.

### **When noting sticks to Teflon how come it sticks to the pan.**

The reason is the fluorine enveloping its molecules. The trick to it is to use it in layers. Firstly the pan is sandblasted to create lots of little pits and scratches on the surface of the pan. Then a primer liquid having low viscosity is poured which goes into the cracks, which is then heated to cure it into a solid layer. this primer liquid is a mixture of C-H bond of normal polymer on the other side which sticks to the metal surface and C-F bond of Teflon on one side which is left pointed upwards. When the Teflon is poured into this it readily sticks to the primer because of pointed C-F bonds. Further heating is repeated which allows Teflon to form a bond with primer and make it solid.

Using non-stick cookware is safe. Teflon itself is inert, meaning it's not going to react with chemicals inside or outside your body. But heating Teflon-coated pans very hotly (if you placed an empty non-stick pan on high heat on the stove for a long time), can cause temporary symptoms like coughing, fever, or a sore throat. when we use these teflon pans at very high temperatures excessively then the Teflon coating gets worn out and may emit harmful chemicals. So, if you have lingering concerns, Go back to old-fashioned cookware like stainless steel or cast iron cookware instead of non-stick pots and pans.

Image source: getty images

**ADITI GOVIND SINGH**  
**BSc (H) CHEMISTRY**  
**III YEAR**







# WATER PURIFICATION USING NANOTECHNOLOGY

Nanotechnology is a technique that deals with nano-size particles. The particles of this size have some unique physicochemical and surface properties. This is a new evolving technology that is giving good solutions to some of the major problems which we are facing at the global level such as a supply of safe drinking water at a large scale. Water can be purified to a great extent using this technique. Water purification using this technique uses some nanoscopic materials such as carbon nanotubes and alumina fibers for nanofiltration. The nanoscopic pores in the zeolite filtration membranes, the magnetic property of the nanoparticles and also nanocatalysts play a vital role in water purification.

The nanosensors based on titanium oxide nanowires or palladium nanoparticles are used for the analytical detection of the contaminants in the water samples. The toxic trace elements such as arsenic, viscous impurities like oil, turbidity, organic contaminants can also be removed using carbon nanotube membranes and using this technique. The nanofibrous alumina filters and other nanofiber materials can easily remove the negatively charged contaminants at a faster rate.

Image

source:

<https://pamelanorris.wordpress.com/research/>  
<https://www.cheaptubes.com/product/multi-walled-carbon-nanotubes-10-20nm/>







# NEUTRONS AND NOTHINGNESS

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The protons and electrons symbolise the dual nature of our consciousness. We all have positive and negative traits, feelings, and emotions. The good and the evil reside in all of us. The world makes the atoms react, sometimes making them grim negative and sometimes making them sunny positive. We dangle with the charges, and we often tend to forget the neutrons, the mystical as well as very essential particle defining the absolute existence of atoms. A neutron with no charge yet having the power to penetrate deep into matter, symbolizing the existence of nothingness, a zero experience and above all a seat of supreme consciousness in all of us.

The consciousness beyond the good and the evil, the consciousness that is there in all of us yet hardly realized. We look upon ourselves as agents of limited actions and receiving equal reactions and the receivers of happiness and pain. However, in the state of zero experience we know ourselves as our soul that is swayed and fashioned by the hands of the divine characterized by unlimited understanding, purity, love and peace. To be in supreme consciousness is to know the endlessness of our being in eternity. Image source: Shutterstock

# BLOGGER'S CORNER

## Polyethylene: From Grocery Bags to Sustainable Futuristic Fabric .....SERIOUSLY??

Article | Published: 15 March 2021

### Sustainable polyethylene fabrics with engineered moisture transport for passive cooling

Matteo Alberghini, Seongdon Hong, [...] Svetlana V. Boriskina

Nature Sustainability (2021) | Cite this article

764 Accesses | 270 Altmetric | Metrics



Credit: Svetlana V. Boriskina  
Polyethylene fabric is comfortable and recyclable.

### Could polyethylene be the sustainable fabric of the future?

Textiles made from this popular plastic offer stain resistance, passive cooling, and recyclability

by Bethany Halford

MARCH 17, 2021 | APPEARED IN VOLUME 99, ISSUE 10



Designer Craig Green debuts plastic menswear on the runway

Recently, I came across an interesting research article published in Chemical & Engineering news (c&en), that mentioned polyethylene as a sustainable futuristic fabric. There was an unusual sense of suffocation when I first read it. Polyethylene bags!!! Of course, robust enough to carry plethora of materials used in our day today life. However, I haven't ever imagined polyethylene as a potential alternative to cotton, silk, wool etc.

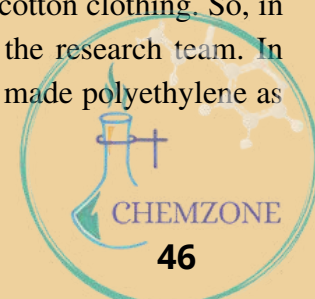
Well! Polyethylene based Haute Couture is possible as the fashionista models are proficient enough to carry weirdest of the clothes. But, I find it extremely difficult to imagine futuristic Indian brides flaunting heavily embellished Polyethylene Sabyasachi Lehenga.....Isn't it crazy!!!!

And what about the effect of heat on these polyethylene based fabrics? Will it carry a caution "not to be worn in close proximity of fire!!"

Ok...enough of these presumptions. I have immense faith on the research fraternity. If they have anticipated polyethylene as a futuristic fabric, they must have a firm experimental background to justify this. Let's explore the scientific aspect.

A research team at Stanford University proposed that the designed polyethylene fabric (nanostructured polyethylene layers with cotton mesh interwoven between them) will keep a person twice as cool as the conventional fabric. They explained that our body cools in two ways; through i) perspiration (the regular fabric cools body by allowing the sweat to escape) and through ii) infrared (IR) radiation (a benign wave of light emitted by almost all bodies). The conventional fabric traps the IR emission, whereas, the polyethylene layer allows IR waves to escape (IR transparent) resulting into 4 degree Fahrenheit less temperature than the cotton clothing. So, in a nutshell, the designing of fabrics with thermal radiation characteristics is highlighted by the research team. In addition to this, the water repellent nature, self cleaning property and easy recyclability have made polyethylene as a sustainable material of Future...

What is your say on this???







**srishtiprasad19** With the growing craze for fashion and people trying to look their best, trying out new styling ideas every day a person keeps a piece of clothing for an average of 3 years. Might not the demand for this new fabric increase suddenly, leading to the increase in production of plastic rather than recycling it. Our daily necessities often contain products made of polyethylene. While polyethylene fabric being the new revolution can the other items be discarded? Cloth recycling takes place now too but isn't it true that we have a greater amount of cloth produced than being recycled. So the question arises will introducing a new item made up of something that is already contributing to pollution will decrease its productivity or rather increase it. Can production and recycling take place at the same rates with increasing demands?



**tanisha\_singhh** Plastics as fabrics, obviously the idea is worth turning a lot of heads around unlike any other fashion trend.

However, as interesting as it may sound, this is not as simple as it looks.

In my opinion, the various weathers of different regions across the globe will have to be taken in consideration. It should not just be about giving the cool effect, but provide warmth too, which obviously science can do.

As per the recycling of the clothes is concerned, taken the fact that according to the linear fashion model about 70% of our clothes end up in landfills, the recycling of these polyethylene made clothes is a bigger factor to be looked at. And the step which will require the most effort in my sense, will be to broadcast the products and making the actual audience apart from models and stars, actually buy and wear these clothing in their day to day lives. So basically it comes down to how

a layman is made in terms with the scientific aspects of this innovative clothing.

**himani\_goyal1** The idea is exciting but unrealistic to be honest. Many factors have been ignored before calling polyethylene the sustainable fabric of future like.. research is done on how it cools human body but what about the warmth. People with sensitive skin, would they be able to adapt to this fabric or they will be prone to skin allergies? how will the indian mindset react to this idea..will people be comfortable choosing plastic over cotton wool and silk. what about people who are working in the area of cultivating traditional fabric..a large number of people would be unemployed. They say that plastic would be recycled but look at the present scenario the ratio of plastic being used and that being recycled. Marine life getting affected because of tons of plastic is not new. Who knows that this idea would not only be a fashion statement for a while and people then going back to traditional clothing ideas.



**arushi\_rawat16** This idea seemed a bit weird when I first read about it. Talking about innovative thought, yes it is a good approach in order to reuse polyethylene and towards sustainable development. But it seems kind of unrealistic because it's easier said than done. It is gonna require a lot of research to get this idea going. Also, this article says that it is engineered in such a way that it should provide cooling effect, but then at the same time there are numerous places across the globe where there is a need for fabrics to provide warmth. Another factor that is needed to be considered is the recycling of this plastic, because if it's not taken into consideration, this poses another problem of increasing pollution, and this might as well be the opposite of what is called sustainable.







**vats\_vani** Well, Plastic and clothing...!!  
Weird enough...

But the weirder the idea, the more appealing it shall be when it becomes a reality.

The very first question that crossed my mind was - Why in the world would I use plastic over soft and traditional fabrics? The article has the answer - it keeps you relatively cool than pure cotton clothes.

Then again the argument arises - Will these clothes provide with the comfort and softness which I'm used to... ?

The idea is intimidating. This sure will help in reducing current global plastic garbage challenge.

But, I'm of the opinion that this should not be used extensively because with the supply of these clothes would come the demand for plastic.

We need to ensure that in the long term, no more FRESH PRODUCTION of plastic shall be done and focus should be on exhausting the already existing plastic.

In order to ensure proper recycling and disposal, units be set up alongside distributor businesses to collect these

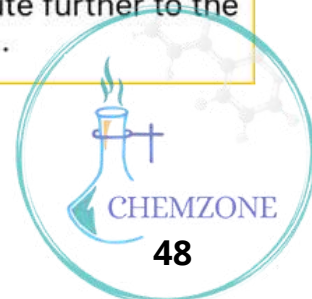


**kartika\_goyal** The concept of using polyethylene as a future fabric seems very new concept at first sight. Yet this might not be the case. Ideas evolve over generations. Here ideas go back to 1960s when PVC pants were introduced (more often in raincoats) primarily for protection purpose. Time grows and researchers at Stanford, MIT and other reputed institutions look out for possibilities and limitations that come alongside with using plastics as a substitute for cotton, nylon and other fabrics. Most commonly used cotton often requires a lot of land, fertilizers and harsh chemicals making its synthesis less eco friendly as compared to synthesis of raw polyethylene as it releases less greenhouse gases, researchers added. Additionally it has low MP which in turn means less heat required to convert it into yarn as compared to other fabric materials. Less often it gets dirty when compared with cotton clothes. Also, it was stated that as human body naturally emits IR so fabrics improvising cooling in body are to be focus. Here too, polyethylene especially nano forms are effective as they trap no radiation which in turn we

**yamini\_chadha** Well at first when I read about the idea of using polyethylene as a wearable material..I found it quite absurd..due to the problems associated with polyethylene especially its degradability..Also after reading about this innovative idea the first thing that came to my mind is that for me clothing refers to comfortability..Will polyethylene be giving that comfort?? Will it be skin friendly?? and moreover if polyethylene somehow manages to replace the traditional fabrics what would happen to the traditional fabric making industries?? moreover today in a world where researchers are trying to find an alternative for plastic..will it be a great idea by using plastic as clothing material and increasing its usage??



**urvashi.joon** if these polyethylene fabrics are used and they prove to be fruitful...then obviously it's a great opportunity for us to utilize polyethylene which is now responsible for a major part of soil pollution....but we have to see that they do not contribute further to the pollution level on earth....





# RESEARCH INTERNSHIP OPPORTUNITIES



**Indian Institute of Technology (IIT)**

<http://surge.iitk.ac.in/>  
<https://spark.iitr.ac.in/>



**University of Delhi (DU)**

<http://ir.du.ac.in/students/>  
<http://csec.du.ac.in/training.html>



**Indian Institute of Science (IISc)**

<http://www.cense.iisc.ac.in/content/summerprogram>



**Indian Institute of Science Education and Research**

<https://www.iiserkol.ac.in/~summer.research/>  
<https://www.iiserpune.ac.in/~sspc/>



**Indian Space Research Organisation (ISRO)**

<https://www.isro.gov.in/research-and-academia-interface/internships-projects-training>



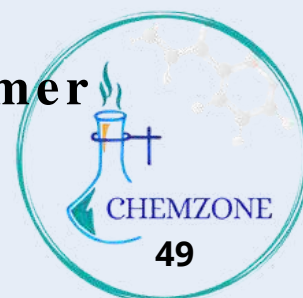
**Tata Institute of Fundamental Research (TIFR)**

<http://univ.tifr.res.in/gs2021/vsrp/vsrp.htm>



**Indian Academy of Science (IAS), Summer Research Program Fellowship**

<https://www.ias.ac.in/>



# Online Resources for Undergraduate Education & Research



**National Programme on Technology  
Enhanced Learning**

<https://nptel.ac.in/course.html>



**Study Webs of Active-Learning  
for Young Aspiring Minds**

<https://swayam.gov.in/explorer>



**American Chemical Society**

<https://www.acs.org/content/acs/en/education/students/college/research.html>

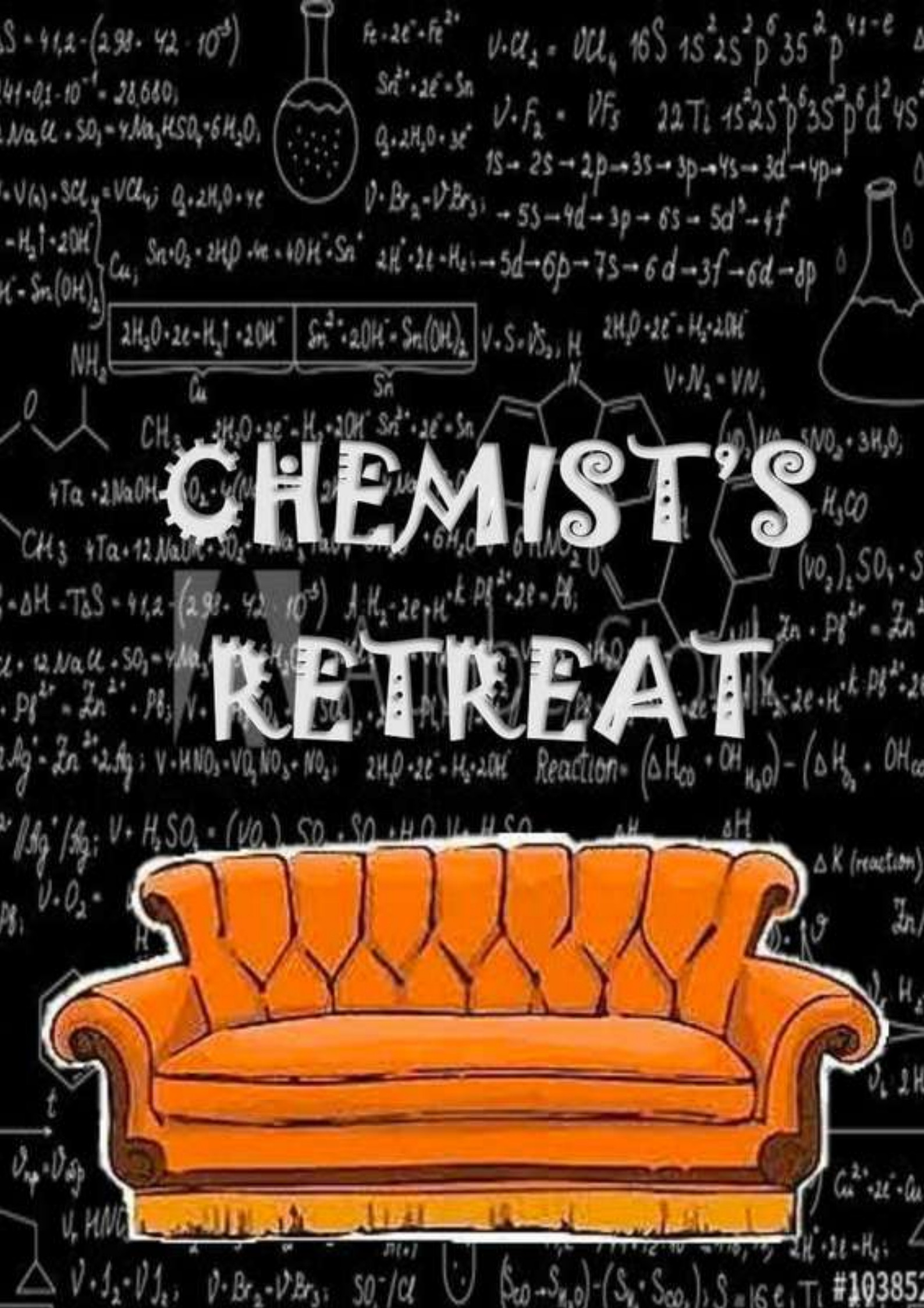


**The National Science Digital  
Library**

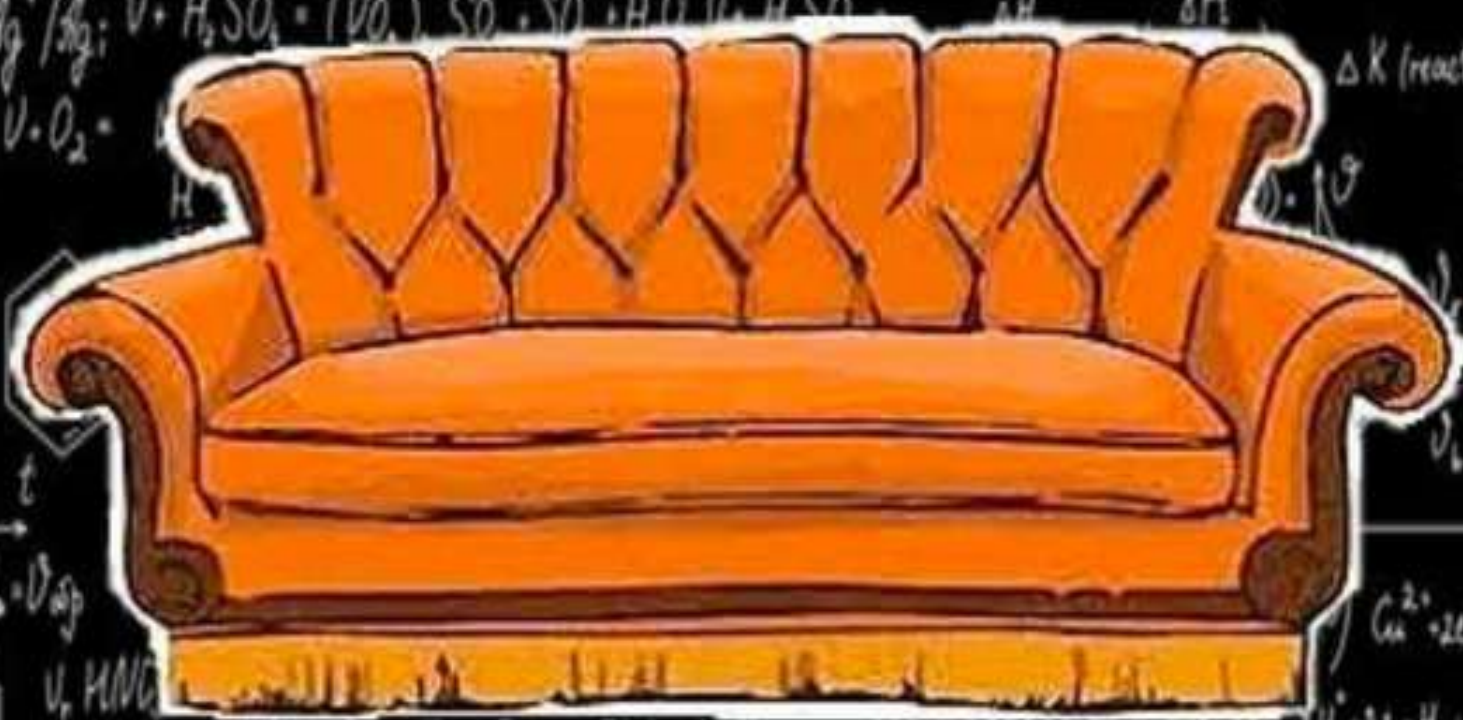
<https://nsdl.oercommons.org/>







# CHEMIST'S RETREAT



# LAUGH OUT LOUD

Every chemist deserves a prospect. therefore place down that beaker and remove your safety glasses, and have some chemistry jokes and riddles.

● Once a neutron went to a bar and asked the barman “ how much for a drink?” The barman said respectfully, for you ‘no charge’ sir.

● Why do chemists find working with ammonia easy?  
Because it's pretty basic stuff

● I literally hate when people reply me with ‘ K’ Seriously I am in no mood to talk about potassium

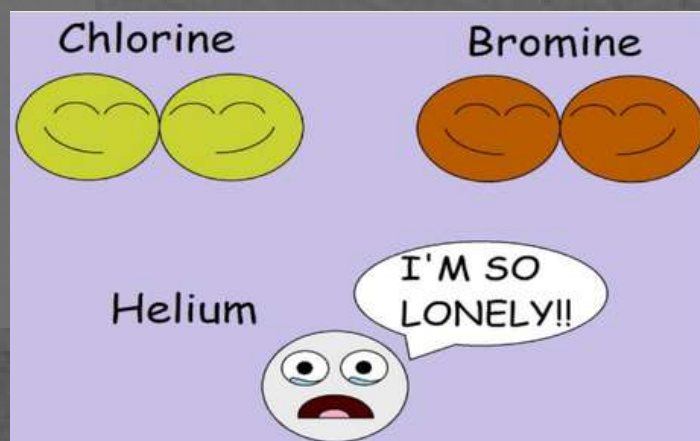


Image source: [www.funnycaptions.com](http://www.funnycaptions.com)

● Do you know why chemists can solve any problem?  
They have all kinds of solutions.

Two men walk into a bar.  
One man orders  $H_2O$ .  
The other says,  
"I'll have  $H_2O$ , too."  
The second man dies.

Image source: [www.pinterest.com](http://www.pinterest.com)

● Do you want to listen to a joke regarding sodium, Bromine and Oxygen  
 $Na BrO$

● You say you don't know about lithium and argon .  
 $Li Ar !$





# ASTOUNDING FACTS

- If there was no space between atoms, the entire population could fit into an apple.
- There is a myth that Diamonds come from coal. But the truth is that they are carbon that is compressed and heated 90 miles below the surface of the earth. Coal is found about 2 miles down.
- A liter of sea water contains 35 grams of salt more than half of which is NaCl. The rest is mainly calcium and magnesium chlorides and sulphates, which ultimately give sea water a bitter taste.
- Every hydrogen atom in your body is likely 13.5 billion years old because they were created at the birth of the universe.

- A human body has about 7 octillion atoms and 98% of them are replaced every year.



Only one letter doesn't appear  
in the periodic table!

**It's the letter J**

Go ahead and double check.

Image source: <https://m.facebook.com/scienceisall/>

- The smell of lemons, oranges and pine is determined by the same substance- Limonene. The “citrus” and “pine” versions of limonene consist of identical atoms, combined with one another in an identical order. That is why they smell different to us.



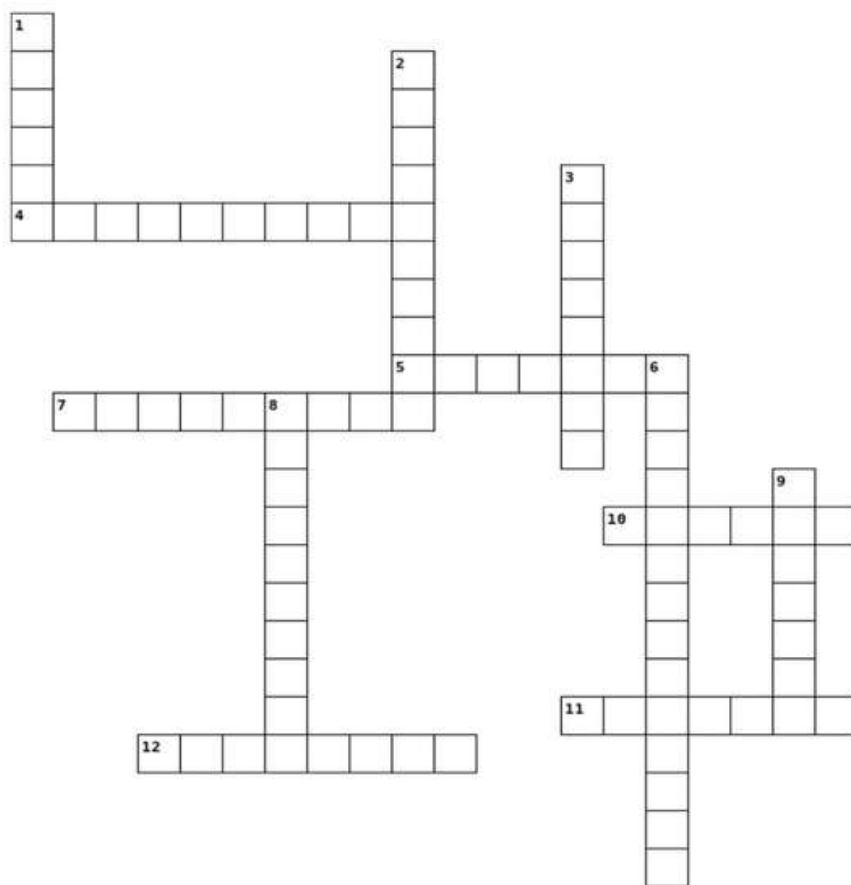
# THE CHEMISTRY QUIZ

1. Elements have been named after their places of discovery. These places include the names of the continents, countries or even villages. The element gallium was named after a place now known as :
  - i. GERMANY
  - ii. FRANCE
  - iii. GREECE
  - iv. GREAT BRITAIN
2. Which element has the most number of stable isotope
  - i. TIN
  - ii. XENON
  - iii. MERCURY
  - iv. BARIUM
3. Four elements contribute towards more than 96% of the human body weight. Three of them are carbon, hydrogen and oxygen. The fourth one is :
  - i. CALCIUM
  - ii. NITROGEN
  - iii. PHOSPHORUS
  - iv. SULPHUR
4. Only one element in the periodic table was neither discovered nor was synthesised but was identified in a different way. This is :
  - i. SODIUM
  - ii. HELIUM
  - iii. ZIRCONIUM
  - iv. CADMIUM
5. Which one is the first artificially created element ?
  - i. CURIUM
  - ii. AMERICIUM
  - iii. NETUNIUM
  - iv. SULPHUR
6. Identify the scientist whose name is associated with the discovery of the noble gas.
  - i. WILLIAM RAMSAY
  - ii. ROBERT BOYLE
  - iii. MARIE CURIE
  - iv. FRITZ HABE





# CROSSWORD



## ACROSS

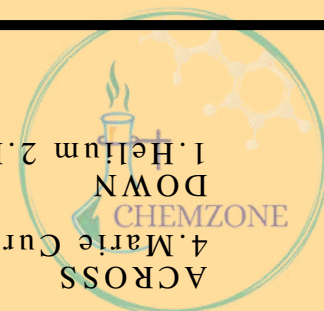
4. Nobel Prize in both physics and chemistry
5. first element of  $4n+2$  series
7. element showing scarlet flame colour
10. element having lowest melting point
11. element that causes minamata disease
12. alloy of Cu,Zn,Su

## DOWN

1. highest ionization potential
2. lanthanide that doesn't occur in nature
3. halogen that doesn't form Oxyacid
6. discovered electromagnetic induction
8. first synthetic element
9. element showing maximum catenation

## ANSWERS

ACROSS  
 4. Marie Curie 5. Uranium 7. Strontium 10. Radium 11. Mercury 12. Gun metal  
 DOWN  
 1. Helium 2. Promethium 3. Fluorine 6. Michael Faraday 8. Technetium 9. Sulphur



# Our Esteemed Alumni

Most of our students go in for higher education and research. Our alumni have established themselves in almost every field of their lives may be teaching at various colleges and research at eminent institutes. They are serving their nation and world at prestigious positions. Few are listed as below :



Dr. Ipsita Roy  
Associate professor,  
NIPER, Mohali,  
Punjab



Dr. Bimlesh Lochab  
Associate Professor ,  
Shiv Nadar  
University



Ms. Jyoti Challi  
President and CEO  
Banyan Foundation  
Inc., California, US.



Dr. Jency Thomas  
Assistant Professor,  
Thichussar University  
Kerela



Dr. Ashu Gupta  
Assistant Professor ,  
Shyamlal College  
University of Delhi



Dr. Sarita Tehran  
Assistant Professor,  
Motilal Nehru College  
University of Delhi



Ms. Nidhi Yadav  
Flying Officer,  
Indian Air Force



Ms. Suparna Chaganti  
Senior Director, Health  
Plan Client Services ,  
UnitedHealth Group



Ms. Sonal Rihani  
Model,  
Femina Miss  
India East 2014





# Message From Our Proud Alumni

## Dr. Bimlesh Lochab

I was in the batch 1994-1997, BSc(Hons) Chemistry, and it's a pleasure to be part and pursuing my UG studies in the Department of Chemistry, Maitreyi College. I have taken a transfer from Sri Venkateshwara College, South Delhi campus to Maitreyi college as I was really fascinated foremost by the teachers, followed labs and last but not least greenery in the college. The environment is very sustainable, friendly to nourished my aims. I am happy that I have met Prof Rizvi, Prof. Shanti Kesvan, Prof Amritha Anand and Prof Sulekha Dogra who taught us. They were very passionate in their work. Rizvi mam always inspired us about study and ever ready to help. With her help and others too, I got so many books from the Department library which were difficult to procure during that time. I was awarded Radha Sai Ram award with which I bought more books. That era was beautiful. Needless to say all the teachers within the department helped me in numerous ways, which is difficult to describe in words. I remember the encouragement, assistance extended by the all the teachers without any boundaries. There were so many beautiful moments I still cherish, organising the first chemistry festival Chemsophy in 1995. It really bonded us and knitted the memories together further. I am feeling young again and nostalgic and immersed in that time. With the senior teachers as guiding role models, young teachers Dr. Pinkey , Dr Sandhya, Dr Padma, Dr Gita, Dr Manju, Dr.Haritma, Dr. Lata and Dr. Ramesh mam, I am loosing the memories here to recall their name, but I still remember how fascinated I was learning through them.



So many years by passed, I am still in contact with them, love to be a part of any event, and happy to relive that moment again and again. Teachers are Guru, and I love all my Gurus, What I am today is because of them.

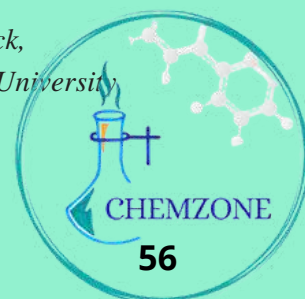
I hope teacher-student relationship is unique and it is of similar level as a mother and daughter. Maitreyi Chemistry department is like a family to me, and it will always be. You may all will be feeling the same, share your aims with teachers, trust me! they will stand beside you, in whichever capacity.

Best wishes  
Bimlesh Lochab

*Associate Professor (M. Tech. IITD, D. Phil. University of Oxford)*

*UG Advisor*

*Department of Chemistry, Research Block,  
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Tehsil Dadri, UP 201314, India*



# MY MUSINGS AS A CHEMISTRY EDUCATOR

## Dr. Swarndeep Kaur Sethi

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### Perpetual Moulding of an Educator

Academia promises excitement and new learning avenues to those who are willing to explore and contribute to this field as a career option. More like every experience, teaching and contributing to mold an individual's logical thinking can be bittersweet. My case wasn't different either. The core essence of chemistry teaching lies in a smooth transition from concept building to its application.

It is this application phase that requires the molding of a person having knowledge into an efficient educator who can shape a learner's thought processes and give them a positive direction. While transitioning into an educator, I found myself at converting many already known facts into teachable information. Learning new and innovative ways to convey one's set of knowledge skills really is and must be a continuous process for every educator.

Amidst the chaos of one's own life, I found peace and tranquillity in every classroom I went in, to be a part of a young and dynamic crowd wanting to learn something new that day, that hour. The challenges faced by an educator every day are not only to educate curious minds satisfactorily but also to develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world. The latter contributed immensely in making my wayward energies monochromatic too.



*"The function of education is to teach one to think intensively and to think critically. Intelligence plus character – that is the goal of true education.*

*-Martin Luther King Jr."*

Understanding the Curious Minds Every Passing Year  
The classroom at each level of learning is filled with learners presenting a different way to absorb knowledge and having their own levels of curiosity. Each learner shapes the educator with their own special personality. It is our good fortune as educators and teachers to meet the most diverse talent and minds all at one place. I got this good fortune with added glitter when I got a chance to teach at my alma mater, Maitreyi College, University of Delhi.

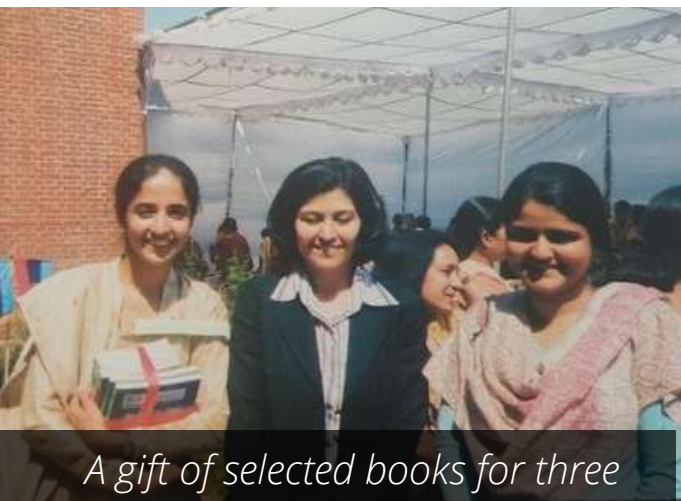
As I entered those hallowed pathways leading up to my classroom and the chemistry laboratory, where I spent three golden years of my life, I undeniably had goose bumps. I felt a special bond with every single learner. I also felt the need and responsibility to give every extra bit of effort that the college and its distinguished faculty had also given me during my formative years.







*Maitreyi College – my alma mater  
taught me how to win with elan*



*A gift of selected books for three  
consecutive years*



*Alumni guest at Chemsophy 2017*

Chemistry is an ever-evolving domain of science. Thus, the idea of concept building and its application in the laboratory is a sure-shot method of success. Thus, student-centric methods to develop knowledge and understanding of scientific ideas is the need of the hour.

I have long felt that when students get a sense of dignified freedom and trust from their teachers they shine brightly in their fields of interest. A dedicated expression of passion and zeal shown by teachers and students alike make a great collaborative winning combination for both.

***"Education is not filling of a bucket, but the lighting of a fire.***

***-W. B. Yeats"***

**‘Guru-Shishya’ – A Lifelong Bond of Knowledge Sharing**

The gain of knowledge bestows wisdom along with numerous good virtues in a learner. Innovative learning methods, multilevel assessments ensure a deep rooted gain of expertise of a subject. This approach has long been a part of our culture and makes an individual learner a great asset to the society. Great alma maters instil a deep-rooted connection with their students and inspire them to grow into successful individuals.

The COVID-19 pandemic brought the ‘new normal’ into our teaching methodology. Tremendous efforts put in by teachers and students alike proved yet again that the ‘Guru-Shishya’ is an ever evolving relation which curates its own path with the need of time.

***"Technology will not replace great teachers but technology in the hands of great teachers can be transformational.***

***-George Couros"***





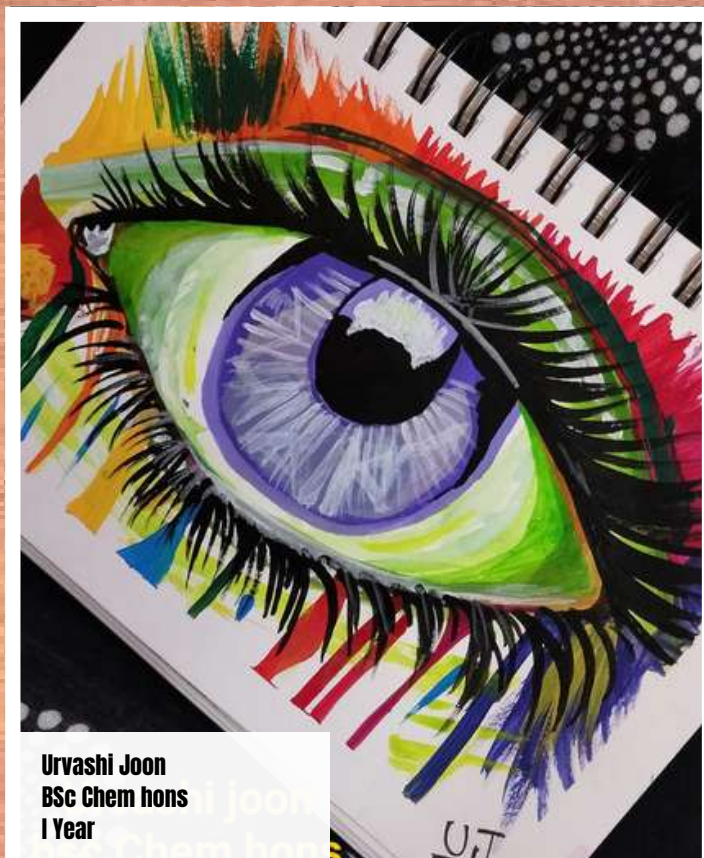
# *From an Artist's Vision*



# Students' Artwork



**Raaina**  
BSc (H) Chemistry  
I Year

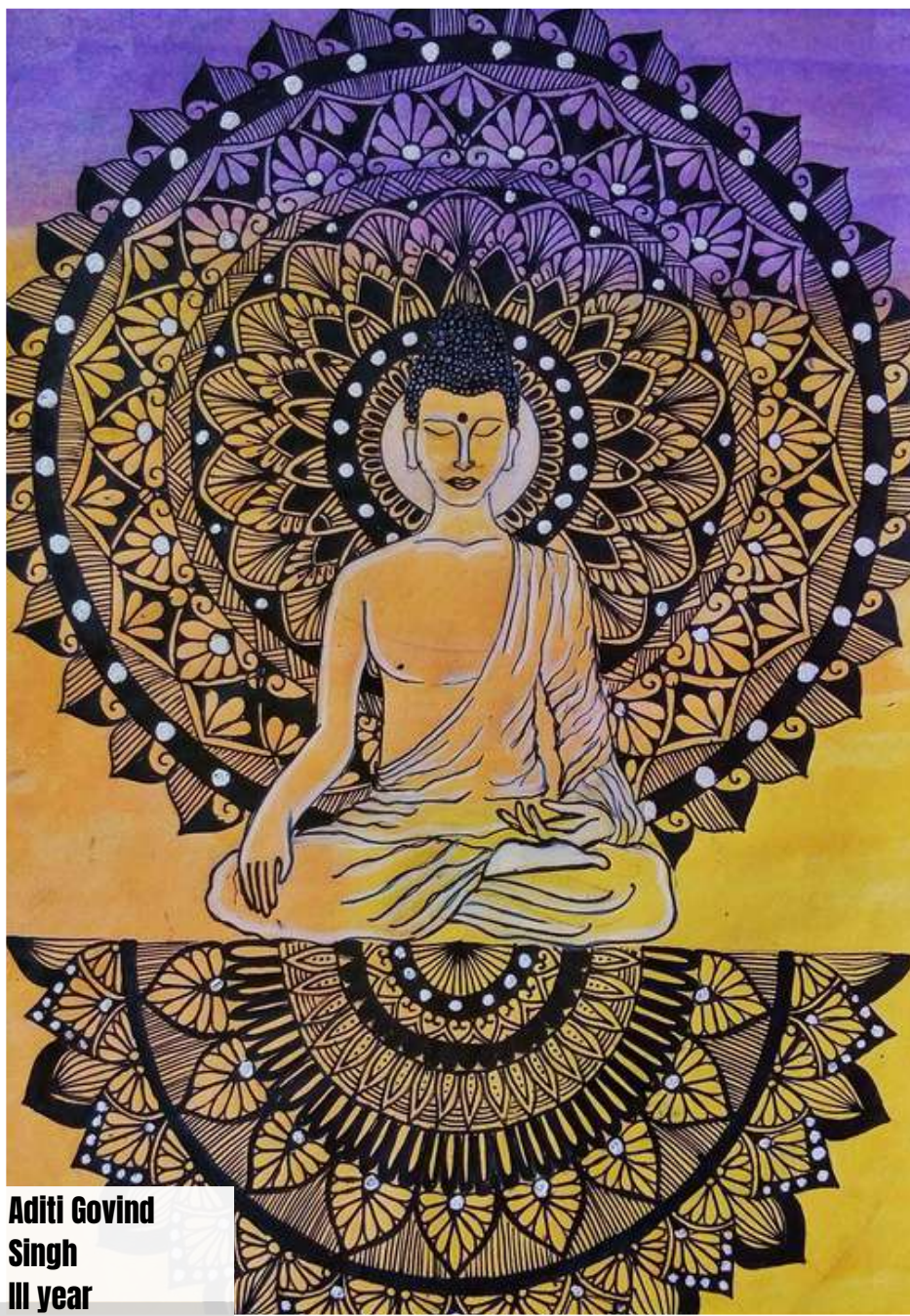


**Urvashi Joon**  
BSc Chem hon  
I Year



**Leesha, BSc Chemistry (H), II year**





**Aditi Govind  
Singh  
III year**

*"The  
greatest  
scientists  
are  
artists  
as  
well"*

*-Albert  
Einstein*



**Keti Singh  
BSc (H) Chemistry  
I YEAR**



**Reeva  
BSc (H) Chemistry  
I Year**







**Leesha**  
BSc (H) Chemistry  
II Year



**Prachi**  
BSc (H) Chemistry  
I Year



**Charu Gupta**  
BSc (H) Chemistry  
III Year

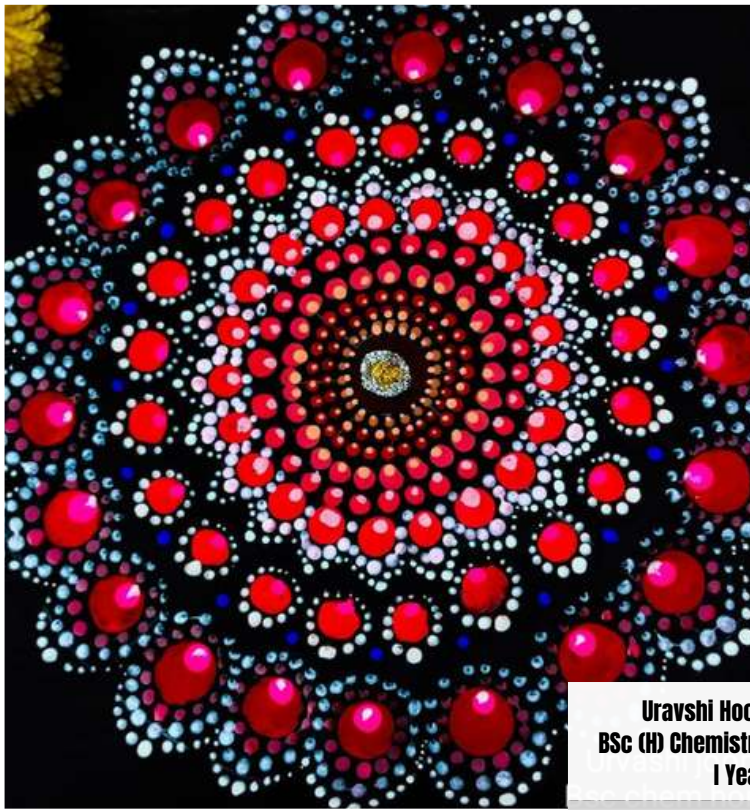


**Raaina**  
BSc (H) Chemistry  
I Year

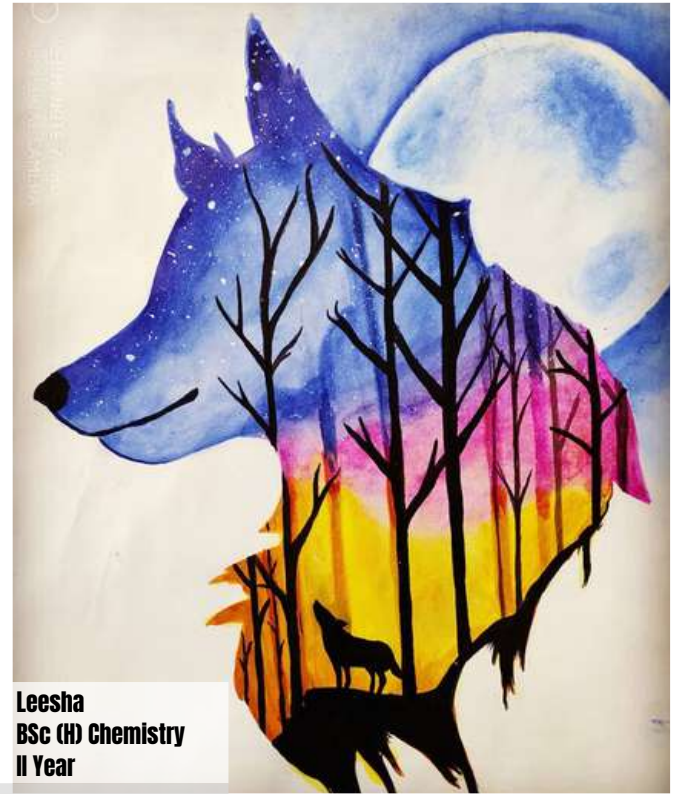


**Raaina**  
BSc (H) Chemistry  
I Year





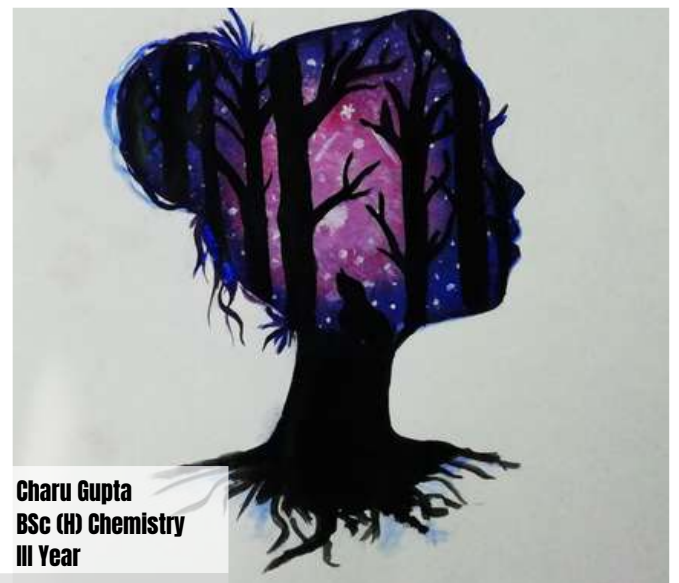
**Uravshi Hoon**  
BSc (H) Chemistry  
I Year



**Leesha**  
BSc (H) Chemistry  
II Year



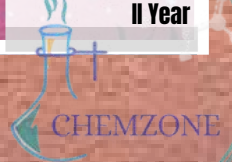
**Aditi Govind Singh**  
BSc (H) Chemistry  
III Year



**Charu Gupta**  
BSc (H) Chemistry  
III Year



**Sakshi Rajan**  
BSc (H) Chemistry  
II Year







**RADHA SAIRAM CHEMICAL SOCIETY**

*Presents*



**THE CHEMISTRY E-BULLETIN 2021**