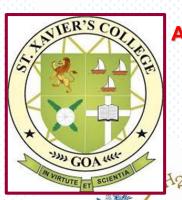
# St. Xavier's College Mapusa-Goa



Awarded 'College with Potential for Excellence' by UGC [2004]

Reaccredited by NAAC with Grade 'A' 4th Cycle [2019]

Awarded the DBT Star College Scheme [2021]

**Department of Chemistry** 

# CATALYST

"Be a catalyst and enrich your life and those around you."





**VOLUME: XIV** 

2024 - 2025



## **OUR VISION**

To use the knowledge of Chemistry for the benefit of society and the conservation of the environment.

## **OUR MISSION**

To ignite the spirit of inquiry, creativity, independent thinking & responsibility in our students and teachers.

## **OUR OBJECTIVE**

To impart knowledge, foster understanding and enhance the application of Chemistry Education to students.

To develop / enhance laboratory skills in students.

To enhance the moral development of students and help them to be disciplined world citizens.





## **Prayer to St. Francis Xavier**

O glorious St. Francis Xavier, we turn to you with confidence in our times of need. Your zeal for the spread of the Gospel and your unwavering dedication to serving others inspire us to follow in your footsteps.

May we, like you, be filled with a burning passion for sharing the love of Christ with others.

May our hearts be open to the needs of those around us, and may we be instruments of God's love and mercy. May we be guided by your example of humility, perseverance, and trust in God's providence.

Grant us the grace to grow in faith, hope, and charity; to be witnesses to the Gospel in our daily lives; to serve others with compassion and kindness

Amen.

## **Head of Department**

Ms. Kathleen Pinto

# Editor Dr. Johnross Albuquerque

## **Teaching Faculty Members**

Ms. Janesline Fernandes, Ms. Edwina Pereira, Mr. Mahesh Nair, Ms. Sheryl D'Cruz, Ms. Shivta T. Mhamal, Ms. Flavia S. Travasso, Dr. Andrew D'Souza, Dr. Mira Parmekar, Dr. Rheane da Silva, Ms. Milagrina D'Souza and Mr. Clarence Rodrigues

## **Laboratory Staff**

Mr. Cajetan Silveira, Mr. Douglas D'Souza, Ms. Susmita Parab, Mr. Savio Coutinho, Mr. Suresh Parsekar, Mr. Vishnu Singh and Mr. Malcolm Dias

# Administrator's Message



The world is being increasingly shaped by scientific advancements. These advancements are affecting every aspect of our life, and hence we need to prepare ourselves to face the emerging global challenges. Chemistry opens the doors to a wide range of opportunities to the students from cutting edge research, industrial innovation and entrepreneurship. In order to prepare our students to face these challenges, the College organises various seminars, mentorship programmes, internships, inputs on various topics by the alumni of this College, multidisciplinary education, etc.

Chemistry helps in the development of the students' faculties, like critical thinking, creativity, problem-solving skills, besides attiring them with scientific knowledge. These are also the demands of the industry today, as it would like to have on its roll people who are creative, with ability to solve problems, and have a personality that is engaging, shows concern towards the needy, and doesn't use the industry merely for narrow personal gains. Hence, the students need to stay curious and engaged, should not hesitate to reach out to the professors and peers, and definitely not shy away from research, and apprenticeships. The path ahead is full of challenges but also with many potentialities. They should remember that the management and the staff is with them in this their journey of life.

I would like to end with this beautiful thought: "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.

My hearty congratulations to the HoD, staff and students for bringing out this newsletter which, I am sure, will benefit all. God bless everyone.

Fr. Tony Salema Administrator

# Principal's Message



I am happy to learn about the upcoming release of 'Catalyst' the newsletter of the Department of Chemistry. The various activities organised by the department throughout the year, provide rich learning experiences for students.

The initiatives not only help students understand the world of chemistry but also equips them with critical thinking, problem-solving, and analytical skills. I appreciate the efforts put in by all the faculty members and extend hearty congratulations to the editorial team of this newsletter, led by Dr. Johnross Albuquerque.

I wish them continued success in imparting chemistry education and inspiring future scientists.

I look forward to seeing the impact of the department's work on the students and the community.

Ursula Barreto Acting Principal

# **Message from Head of Department**



It gives me immense happiness to present the XIV volume of Catalyst, the annual newsletter of the Department of Chemistry, St. Xavier's College, Mapusa–Goa. This edition captures yet another vibrant and productive academic year, filled with achievements, collaborations, and inspiring journeys of our students and teachers in the world of chemistry.

Our vision to use the knowledge of chemistry for the benefit of society and the conservation of the environment continues to guide our activities. This year, we hosted a variety of events — from cutting-edge guest lectures and certificate courses to industry visits, research internships, and state competitions. The signing of MoU with an **Pharmaceuticals** marked a milestone in our industry-academia partnerships, opening new avenues for student internships, joint research, and skill development.

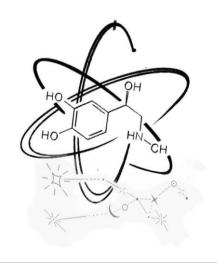
The success of initiatives like the Festival of Innovation, Chemscope 2025, and National Science Day celebrations reflects our collective commitment to fostering curiosity, creativity, and innovation. Our field visits to premier research institutions, industries, and sustainability- driven enterprises bridged classroom learning with real-world applications, while our workshops and training programs equipped students with advanced analytical, computational, and practical skills. Dr. Andrew was a recipient of 4 Projects an achievement for the department.

I congratulate our students for their academic excellence and spirited participation in departmental activities. I also extend heartfelt gratitude to our dedicated Teachers for their wholehearted cooperation in the conduct of all the activities. I am grateful to our laboratory staff, alumni, and collaborators whose unwavering support and enthusiasm have made this year's achievements possible.

I am grateful to Dr. Johnross Albuquerque for bringing out yet another issue of Catalyst documenting all the activities conducted during 2024-25. May Catalyst continue to inspire our students to think critically, explore passionately, and contribute meaningfully to science and society. I am grateful to our Principal, Administrator and management for supporting our programmes.

I am thankful to God for a beautiful year 2024-25.

Ms. Kathleen Pinto Head, Department of Chemistry St. Xavier's College, Mapusa - Goa





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Artwork (Painting using natural colours) by FY Chemistry Major student Ms. Kimaya Simepinishkar as part of VAC course Chemistry in Daily Life



## T.Y. CHEMISTRY EXAMINATION RESULTS

2024 - 2025

## **FIRST TEN TOPPERS**



## Ms. Ritusha Jeetendra Palyekar

83.46 %



Ms. Simran Firoj Shaikh

81.23 %



## Ms. Saloni Sandeep Raul

80.38 %



Mr. Vedant Alias Chandrakant Pilankar

79.92 %



Ms. Tamanna Shaikh

79.15 %



Ms. Saishma Prasanna Naik

78.38 %



Ms. Prajakta Krishna Malik

77.92 %



Ms. Ishika Sandesh Chodankar

74.00 %



Ms. Richa Rama Satelkar

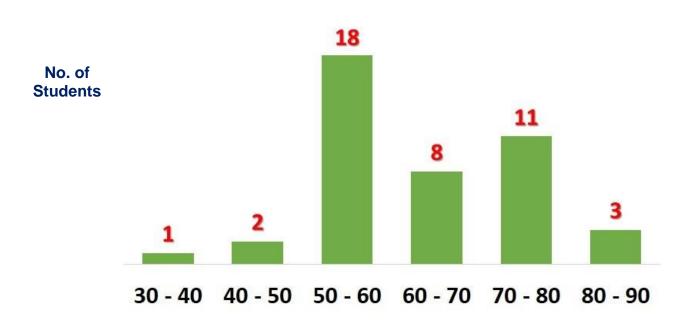
73.54 %



Ms. Vaibhavi Shankar Parab

73.46 %

## **OVERALL PERFORMANCE**



Percentange



The Chemistry Department extends its warmest congratulations to all students, especially the top 10 students who have excelled at the T.Y. BSc. Examination. Your exceptional performance reflects your dedication, deep understanding, and passion for the subject.

We encourage you to continue exploring the vast and exciting world of chemistry. Your potential is limitless, and we look forward to seeing where your scientific curiosity will take you next.

**Departmental Activities** 2024 - 2025

# **ALUMNI**LECTURE SERIES

## 22<sup>nd</sup> February 2025

The Department of Chemistry at St. Xavier's College, Goa, organized a guest lecture under the St. Xavier's College-Alumni Lecture Series 2024-25 on February 22, 2025.

Ms. Pooja Godge, a senior research executive at Syngenta Biosciences, Goa, and an esteemed alumna of the department, delivered a session on "Ignite your Knowledge: Explore new skills and stay up-to-date with latest scientific developments." She shared her journey from a student to a senior research executive, emphasizing the importance of hard work, discipline, and perseverance. The session covered topics such as:

- Building strong habits through consistent efforts
- Seizing opportunities and selfimprovement
- Career growth in chemistry and its role in industrial markets
- Emerging trends in Green Chemistry and Flow Chemistry
- Interview preparations and industry expectations

The session was interactive, with students clarifying their doubts during the Q&A segment. Ms. Godge's insights and experiences provided valuable career guidance and motivation, offering students a glimpse into the evolving landscape of the pharmaceutical and chemical industries. The event was coordinated by Ms. Janesline Fernandes and guided by Ms. Kathleen Pinto, HoD, Dept. of Chemistry.

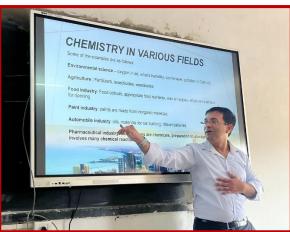




## 18th March 2025

The Department of Chemistry and Post Graduate Department of Chemistry at St. Xavier's College organized a session on "Cutting-Edge Innovation in Chemistry and the Pharmaceutical Industries: Transforming Our World" on March 18, 2025. The guest speaker, Mr. Ajit S. More, Associate Director of Analytical R&D at Solaris Pharma Corporation, USA, highlighted chemistry's impact on various fields, including pharmaceuticals, environmental science, and agriculture.





He discussed the pharmaceutical industry's key divisions, including formulation and analytical departments, highlighting their crucial roles. Advanced instruments like HPLC, GC, MS, and NMR were emphasized as driving innovation in the field. The significance of chemistry in revolutionizing healthcare and improving quality of life was also underscored. Furthermore, he stressed the importance of relentless research and global collaboration in advancing pharmaceutical development and ultimately benefiting society.



Mr. More shared valuable career advice, emphasizing the importance of embracing global diversity in industrial applications. He highlighted the need to adapt to cultural differences and advocate for equal opportunities, fostering an inclusive work environment. Additionally, he stressed the significance of overcoming language barriers to facilitate seamless collaboration among diverse teams, ultimately driving success in the industry.

The session concluded with a Q&A segment, where students asked questions on topics like entering the pharmaceutical industry and regulatory frameworks. Mr. More's inspiring responses motivated the audience to explore the frontiers of chemistry and pharmaceuticals.

## 1<sup>st</sup> April 2025

The Postgraduate and Undergraduate Chemistry Department of St. Xavier's College, Mapusa, in collaboration with the Intellectual Property Rights (IPR) Cell, successfully organized a session on "Innovation and Patent in Emerging Areas of Research" on April 1, 2025. The event aimed to inspire students, researchers, and faculty members by broadening their understanding of innovation, research, and intellectual property.

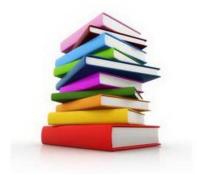


The keynote speech was delivered by Dr. Akshay Salkar, a distinguished alumnus of the college, who shared valuable experiences his and insights on patent filing, nanostructuring, and cutting-edge research areas such as Graphene technology, Self-healing materials, and Electrochromic camouflage. Dr. emphasized Salkar also importance of intellectual property, the key differences highlighting between patents and copyrights.



The session featured an engaging and interactive Q&A segment, where Dr. Salkar addressed thoughtful questions from the attendees. He provided valuable guidance on patent searching, the role of a patent officer, and strategies for overcoming research challenges. The session concluded with a feedback segment and heartfelt words of gratitude, leaving the attendees equipped with valuable knowledge and motivated to explore emerging areas of research and innovation.





# Certificate COURSES OFFERED

## **30-Hour Certificate Course**

# Usage and Maintenance of Sophisticated Analytical Instruments

The Department of Chemistry, St. Xavier's College, organized a 30-hour certificate course from October 7, 2024, to April 8, 2025. The course covered various analytical instruments, including IR, UV-Visible Spectroscopy, HPLC, GC, X-Ray Diffraction Analysis, and Cyclic Voltammetry. 42 students from Chemistry, Microbiology, and Botany departments participated in the hands-on training.

Key sessions included:

- Introduction to chemical analysis and instrumental analysis
- Principles and applications of pH meter, conductivity meter, and analytical balance
- HPLC theory, instrumentation, and applications
- GC techniques and NMR spectroscopy
- UV-Visible spectroscopy, flame photometry, and IR spectroscopy

Cyclic voltammetry and X-ray diffraction analysis. The course featured study visits to the School of Chemical Sciences, Goa University & Glenmark Pharmaceuticals, Colvale, Goa. The course aimed to provide indepth understanding, practical skills & troubleshooting techniques aligning

with the National Education Policy 2020's objectives. As a part of the course, a field trip was organized to Glenmark Pharmaceuticals.

Dr. Andrew D'Souza coordinated the course under Ms. Kathleen Pinto's guidance.

## Resource Persons



Mr. Anant Naik Pharma Consultant & Trainer, ex-DGM, Unichem Laboratories, Goa



Mr. Leo D'Souza Research Scholar, School of Chemical Sciences, Goa University



Dr. Celia Braganza
Assistant Professor in Chemistry,
Carmel College of Arts, Science and
Commerce, Nuvem – Goa



Mr. Prasad Tari Senior Research Executive, Unichem Laboratories, Goa



Mr. Jairus Fernandes Senior Research Executive, Unichem Laboratories, Goa

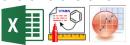








## **Value Addition Course**



## **Computers in Chemistry**

The Department of Chemistry conducted a certificate course on chemistry software for TY and SY students. The course covered three software: Chemsketch, MS Excel, and Origin. Sessions were held on:

- Chemsketch (Feb 24, 2025): Dr. Mira Parmekar taught drawing organic chemistry structures, reaction mechanisms, and electron movement.
- MS Excel (Mar 17, 2025): Dr. Johnross Albuquerque covered functions, formulas, graph plotting, and analyzing reaction endpoints.
- Origin (Mar 18, 2025): Dr. Mira Parmekar demonstrated graph plotting and spectra analysis.

The hands-on course had 28 students from FY, SY, and TY, who brought laptops to follow along. The course was coordinated by Dr. Johnross Albuquerque under the guidance of Ms. Kathleen Pinto, Head of Chemistry Department.







## **Value Addition Course**

## **Chemistry in Daily Life**

The Chemistry Department conducted a value addition course on 'Chemistry in Daily Life' for FY students. The course aimed to highlight some of the practical applications of chemistry in everyday life such as concepts of pH, indicators, cosmetics and perfumes. The course was conducted for 2 days, 26<sup>th</sup> March 2025 and 2<sup>nd</sup> April 2025 from 12:00 p.m. onwards in class room 210.

On the first day, the resource person: Mr. Clarence Rodrigues, Assistant Professor from Department Chemistry gave a brief description of the concept of pH, indicators, pH scale and how pH is computed. The lab session on that day was taken by Mr. Clarence Rodrigues and Dr. Johnross Albuquerque who first demonstrated the color changes that occur to indicators in different pH media. The students were then divided into groups and they found out the titration end points using different indicators.

The second session was on cosmetics and perfumes taken by Dr. Rheane Da Silva who gave a deeper understanding of the fundamentals behind making perfumes, soaps, paints, etc. The lab session included making of different paints using natural components wherein different natural colors were synthesized. Students appreciated the course's interactive approach, which included hands-on activities. discussions, and expert lectures. They expressed a newfound appreciation for the significance of chemistry in their daily lives. The certificate course on "Chemistry in Daily Life" was a resounding success, providing students with a unique perspective on the practical applications of chemistry.

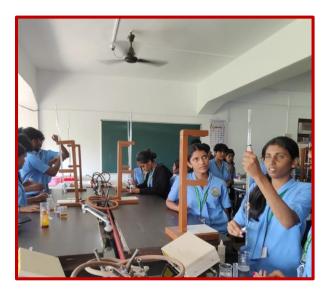
The course was coordinated by Dr. Johnross Albuquerque, Dr. Rheane Da Silva and Mr. Clarence Rodrigues.













The course's interactive approach and expert guidance made it an engaging and enriching experience for the participants. About 28 participants enrolled for the course.



## NOBEL PRIZE LAUREATE SECTION

**John B. Goodenough** (25 July 1922 - 5 June 2023)

A pioneer in sustainability, developer of the lithium ion battery, which today is used to power mobile phones, laptops and enables us to store energy from renewable sources like wind and solar energy.



Nobel Prize in Chemistry (2019), alongside M. Stanley Whittingham and Akira Yoshino.

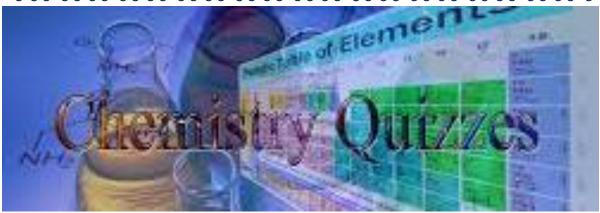
# Frances Hamilton Arnold (born: 25 July 1956)

"I have four brothers and I've jumped into all sorts of things during my life. Learning new things has always been fun for me."

2018 laureate, received the Nobel Prize in Chemistry for her work using evolution to design better enzymes.



Photo: Arnold in graduate school



## 3rd October 2024

A Quiz on ELEMENTARY CHEMISTRY was conducted by Ms. Edwina Pereira for Minor FYBSc students. The group quiz aimed at helping students, internalize the essential concepts. It also provided an opportunity to discuss the knowledge acquired with the peer group.



## 4th October 2024

The Department of Chemistry recently hosted the first round of the Annual TYBSc Class Quiz, which saw enthusiastic participation from 37 Third Year students. The quiz consisted of multiple-choice questions and fill-in-the-blank type questions, covering a range of topics including everyday chemistry, the Nobel Prize in Chemistry, and key concepts from the undergraduate Chemistry syllabus.

The top-performing students from this round will proceed to the next stage, an oral quiz round, scheduled to take place during the even semester. The competition is expected to intensify, with teams facing new challenges and questions.

The quiz was organized by Dr. Mira Parmekar and Ms. Milagrina D'Souza, with support from Ms. Kathleen Pinto, Head of the Department. Dr. Johnross Albuquerque and Mr. Clarence Rodrigues assisted in supervising the quiz, ensuring its smooth conduct. The event aimed to foster a spirit of learning and competition among students, and the department looks forward to the next round.



## 22<sup>nd</sup> February 2025

The Annual Third Year Chemistry Students Quiz was held on 22<sup>nd</sup> February 2025 in the TYBSc Chemistry classroom no. 210. 43 students appeared for this intra-class written quiz co-ordinated by Dr. Mira Parmekar and Ms. Milagrina D'Souza. The shortlisted top 10 stdents made it to the oral round of the quiz. The purpose of the quiz was to increase the aptitude of the students towards the core subject knowledge.

The following student teams were the winners: 1<sup>st</sup> place Mr. Vedant Pilankar and Ms. Samiksha Anvekar; 2<sup>nd</sup> place Ms. Ostira D'Souza and Mr. Narendra Singh; 3<sup>rd</sup> place, Ms. Ritusha Palyekar and Mr. Nehal Patil.



Two more teams which made to the oral rounds were: Ms. Tamanna Shaikh and Mr. Anantaraj Polshet and Ms. Saishma Naik and Ms. Rhutuja Naik. The students were thrilled to answer the quiz which helped prepare them for their future job prospects. The HoD, Ms. Kathleen Pinto supported in the smooth conduct of the Quiz.





2024 Nobel Prize in Chemistry (Baker, Hassabis, and Jumper)

Computational chemists receive prize for protein design and structure prediction



# **CHEMSCOPE**

The Post Graduate and Under Graduate Department of Chemistry at St. Xavier's College successfully Chemscope state-level organized 2025. intercollegiate event, on 28th January 2025. This oneday extravaganza brought together eight colleges from across Goa, providing a platform for enthusiastic Chemistry students to showcase their talents. The chief guest was an alumni of the Chemistry Department, Mr. Siddesh Pilanekar, Formulation Development Manager. Analytics, Unichem Laboratories.

The event featured nine exciting sub-events, including Tik Talk, Chem-Comedy, Chem-Masketeers, Lab-Master, Chem-Model, Mind Spark,

Feel It Reel It, Chem-fit, and Dancing Feet. These activities were designed to boost the chemistry spirit among students, encouraging them to display their creativity and enthusiasm.

Carmel Women's College of Arts, Science, and Commerce-Nuvem emerged as the overall champions, while Government College of Arts, Science, and Commerce of Sanquelim secured the runners-up position.

The event's success was attributed to the guidance and support of the chemistry department faculty, including Ms. Kathleen Pinto, Head of the Chemistry Department; Mrs. Mamata Prabhugaonkar (PG Convenor), Ms. Kalpita Talpekar (Course Coordinator) and Dr. Rheane Da'Silva (UG Convenor). The active participation of students from all participating colleges was the highlight of the event, making Chemscope 2025 a truly memorable experience.



Educational & Industrial visits



## 21st September 2024

The Department of Chemistry, St. Xavier's College, Mapusa, Goa, organized an educational visit to the Kaiga Nuclear Power Plant, Karnataka. The visit aimed to bridge theoretical knowledge with practical applications for 45 undergraduate and 18 postgraduate chemistry students. Upon arrival, the students were escorted to the auditorium, where they received an overview of the reactor's current and future status. A fully automated model demonstrated the reactor's working, providing valuable insights into its operations.



The students were then briefed on how the reactor supplies electricity to neighboring areas, dispelling common myths and sharing insightful information. After a meal, the students visited the simulator room, where they learned about the technicalities involved in running the reactor and the requirements for employment at the organization. The visit was accompanied by faculty members, including Ms. Kathleen Pinto, Mr. Mahesh Nair, Ms. Sheryl D'Cruz, Dr. Rheane Da Silva, Ms. Milagrina D'Sousa, Mr. Clarence Rodrigues, Ms. Kalpita Talpekar,

## 30th September 2024

The Department of Chemistry organized a field trip for 27 FYBSc Chemistry Major students to National Center for Polar and Ocean Research (NCPOR), Vasco-da-Gama, Goa. The objective was to expose students to India's premier R&D institution, responsible for polar and Southern Ocean research. During the visit, students were briefed on NCPOR's mandates, including geo-scientific surveys of the ocean realm around India, polar science and cryosphere studies and exploration of gas hydrates/multi-metal hydrothermal mineralization in the Indian ridge area.





Dr. Ravidas Naik, Project Scientist III, NCPOR, advised students to "work smart and be a part of the solution." Students were fascinated by the wealth of knowledge and interacted with the resource person, expressing interest in undertaking summer/winter research projects at NCPOR. The visit was coordinated by Mr. Mahesh Nair, faculty member, under the mentorship of Ms. Kathleen Pinto, Head of Department.

## 4th October 2024

The Department of Chemistry, St. Xavier's College, Mapusa, organized a field visit to ICAR-Central Coastal Agricultural Research Institute and Goa College of Agriculture, Old Goa, for students of the FY UG Skill Enhancement Course 'Soil and Water Analysis (CHC-141)'. At ICAR, Mr. Omakar Sawant guided the students through the institute's research farms, sharing insights into ongoing projects in crop, livestock, and fisheries research. He also outlined the history and role of ICAR-CCARI in supporting Goa's agricultural development.

Later, at Goa College of Agriculture, Dr. Suresh Kunkalikar highlighted the college's facilities, including its labs, experimental farms, and various hands-on agricultural projects like biocontrol, composting, and organic farming. The visit, coordinated by Dr. Andrew D'Souza and Ms. Milagrina D'Souza under Ms. Kathleen Pinto's guidance, enriched students' understanding of real-world agricultural practices, complementing their classroom learning.





## 10th October 2024

The Department of Chemistry, St. Xavier's College, organized an educational visit to the School of Chemical Sciences (SCS), Goa University. A total of 76 undergraduate students and 5 faculty members participated, coordinated by Dr. Mira Parmekar and Ms. Milagrina D'Souza under the guidance of HoD Ms. Kathleen Pinto. At SCS, Dr. Shrikant R. Naik and Dr. Kedar U. Narvekar welcomed the group and introduced students to the M.Sc. and Ph.D. programs, application process, research collaborations, and funding opportunities. Students toured state-of-the-art labs and instrumentation facilities, including NMR, LC-MS, XRD, HPLC, and more. The visit provided valuable exposure to advanced research and academic prospects, inspiring students to consider higher education and research in chemical sciences.







## 17th December 2024

26 SY BSc Chemistry students visited Vedanta Sesa Goa, gaining first-hand exposure to mining, mineral processing, and power generation. The visit offered

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deep insights into advanced mineral extraction techniques and the company's sustainability initiatives, linking classroom concepts in chemistry, geology, and environmental science to real-world applications.



The visit was coordinated by Mr. Clarence Rodrigues, accompanied by Dr. Mira Parmekar, under the guidance of Ms. Kathleen Pinto, Head of the Chemistry Department. It was a valuable experiential learning opportunity that connected science and industry.

## 6<sup>th</sup> February 2025

The Department of Chemistry at St. Xavier's College, Mapusa, Goa, organized an educational visit to ICAR-Central Coastal Agricultural Research Institute in Old Goa. The visit was part of the FY-UG Skill Enhancement Course 'Water and Soil Analysis CHC-141'. A group of 21 FYBSc students were warmly welcomed by Mr. Omkar Sawant, who led them on a guided tour of the agricultural farm. The students gained insights into the institute's ongoing research projects, cutting-edge initiatives, and significant achievements in agricultural science.



ICAR-CCARI plays a vital role in advancing agricultural excellence in Goa, focusing on improving crop production and productivity, as well as addressing key sectors like livestock and fisheries. The institute's rich history and state-of-the-art infrastructure

were highlighted during the visit. The students benefited from the visit, integrating newly acquired knowledge with classroom concepts. The visit was coordinated by Dr. Andrew D'Souza under the guidance of Ms. Kathleen Pinto, Head of the Department of Chemistry.

## 13<sup>th</sup> February 2025

The Department of Chemistry, St. Xavier's College, Mapusa, Goa, organized an educational visit to Sukraft Recycling Pvt Ltd. A group of 21 students gained valuable insights into the waste paper recycling process, witnessing the transformation of waste paper into high-quality BF Kraft paper. Mr. Vijay Patel, Plant Head & General Manager, welcomed the students and facilitated a comprehensive tour of the plant's operations, sharing insights into Sukraft's innovative initiatives and achievements in waste management. Notably, Sukraft is Goa's only company recycling waste paper and using municipal waste in boilers, reducing fossil fuel dependency.



The visit was coordinated by Dr. Andrew D'souza under the guidance of Ms. Kathleen Pinto, Head of the Department of Chemistry. The excursion deepened students' understanding of sustainable practices and instilled a sense of responsibility towards environmental conservation. The Department of Chemistry extends its gratitude to Sukraft Recycling for their hospitality and expertise-sharing, providing a valuable learning experience for the students.

## 17<sup>th</sup> February 2025

A team of 5 faculty members from St. Xavier's College Department of Chemistry visited Ashutosh Industries in Madkai, Goa. The visit provided valuable insights into:

- Sustainable manufacturing practices (zero-waste policy, recycling, and reuse)
- Innovation and diversification (Astra Edible Ink product)

The visit was conducted under an MOU between the college and Ashutosh Industries, coordinated by Dr. Andrew D'Souza under the guidance of Ms. Kathleen Pinto. The experience was enriching for the faculty members, offering insights into sustainability, innovation, and entrepreneurship.



## 18th February 2025

The Department of Chemistry, St. Xavier's College, organized a visit to the studio of Mrs. Juliette Ravel, a French textile designer based in Goa. Faculty members were thrilled to meet Mrs. Ravel, a pioneer in sustainable textiles, who:

- Completed her Master's in Textile from ENSAD School, Paris
- Established her own studio, focusing on sustainable textiles using plant-based dyes
- Collaborates with renowned artisans across India and France, sharing expertise through consulting, designing, and teaching natural dyeing techniques

The visit inspired faculty members, offering insights into:

- Sustainable practices in the textile industry
- Intersection of chemistry and textile design
- Eco-friendly textile production using natural dyeing techniques

The experience fostered a deeper appreciation for sustainable practices and innovative designs in the textile industry.

## 8th March 2025

A group of 27 FYBSc Chemistry Major students from St. Xavier's College, accompanied by 3 faculty members, visited the Nestlé, Bicholim plant. The visit offered a valuable look into Nestlé's manufacturing processes, hygiene protocols, automation, and export production lines. Students explored stages like raw material prep, batch

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mixing, pasteurization, packaging, and quality control. They were especially fascinated by the use of robotics in Maggi noodle production and the plant's tailored processes for export products.

The visit, coordinated by Mr. Mahesh Nair under the mentorship of Ms. Kathleen Pinto, concluded with a warm gesture - freshly cooked Maggi noodles and gift bags for all participants - making it a truly memorable learning experience.





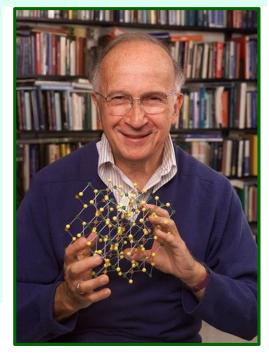
## NOBEL PRIZE LAUREATE SECTION

Roald Hoffmann (Born: 18 July 1937)

"The language of science is a language under stress. Words are being made to describe things that seem indescribable in words – equations, chemical structures and so forth. Words do not, cannot mean all that they stand for, yet they are all we have to describe experience. By being a natural language under tension, the language of science is inherently poetic."

Roald Hoffmann, awarded the 1981 Nobel Prize in Chemistry is - like Alfred Nobel was himself a scientist and a keen poet. In his Nobel Prize biography he explains his love of both.

Read it here: <a href="https://bit.ly/202FPkq">https://bit.ly/202FPkq</a>





The Department of Chemistry, St. Xavier's College, Mapusa - Goa, in collaboration with the Institution Innovation Council, successfully hosted the 9th Festival of Innovation – Goa's Young Innovators, a one-day state-level workshop for schools, higher secondary schools, and colleges across Goa, on February 14, 2025.

## **Inaugural Session**

The event commenced with Ms. Kathleen Pinto, Head of the Department of Chemistry, highlighting the department's initiatives and the journey of the Annual Festival of Innovation over the past eight years. Principal Ms. Ursula Barreto welcomed the gathering of 30 participating institutes, emphasizing the importance of nurturing innovation. Chief Guest Mr. Ryan Vaz, Founder and Director of Infinyt3D, delivered a motivational keynote address, outlining five steps to becoming innovators. Guest of Honor Mr. Rohit Gupta, General Manager of Glenmark Pharmaceuticals Limited, stressed the role of innovation in sustaining industries.





## 

A significant highlight of the event was the formal signing of a Memorandum of Understanding (MoU) between the Department of Chemistry, St. Xavier's College, and Glenmark Pharmaceuticals Ltd., marking a collaboration for academic and industrial growth.



## **Competition and Winners**

The competition featured an array of scientific models based on concepts such as light, sound, sensors, colors, and cleansing methods.













## The winners were:

## **School Category:**

- 1. Ms. Rhyssa Judith De Souza and Ms. Diksha Baile (Our Lady of The Rosary High School, Cujira Bambolim)
- 2. Ms. Kashish Sunil Shirodkar and Ms. Maeve Agisha Almeida (St. Thomas Girls High School, Aldona)
- 3. Mr. Zuriel D'Souza and Mr. Keith Ejipsy (St. Britto High School, Mapusa)

## **HSS Category**:

- 1. Mr. Saksham S. Faldesai and Ms. Tanishka S. Kolvekar (Shree Damodar HSS, Comba, Margao)
- 2. Ms. Deepali Maurya and Ms. Sanvi Gaonkar (People's HSS, Panaji)
- 3. Mr. Atharva N. Chowdhari and Mr. Aaryan A. Kauthankar (St. Xavier's HSS, Mapusa)

## College Category:

- 1. Mr. Siddhant Alornecar and Mr. Vedant Pai (Dnyanprassarak Mandals College and Research Center, Assagao Goa)
- 2. Ms. Alfina Rodrigues and Ms. Aditi Naik (Carmel College of Arts, Science and Commerce for Women, Nuvem)
- 3. Mr. Varad Satarkar and Ms. Aachal Gawandalkar (Ganpat Parsekar College of Education, Mandrem)





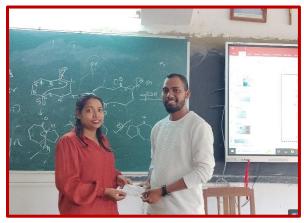
The event concluded with a vote of thanks proposed by Ms. Sheryl D'Cruz, coordinator of the event, and compered by Ms. Ostira D'Souza, a final-year Chemistry student.



# **GU-ART TRAINING**

The Department of Chemistry at St. Xavier's College, Mapusa, organized a comprehensive training program for Third Year BSc. Chemistry students to prepare them for the Goa University Admission Ranking Test (GU-ART). This initiative aimed to equip students with the necessary skills and knowledge to excel in the entrance examination, paving the way for postgraduate studies at reputed institutes in Goa.

The training program spanned five Saturdays, with sessions held in Room No. 210. The program covered core areas of chemistry, including Organic, Inorganic, and Physical Chemistry, with a blend of concept reviews, practice questions, and tips on approaching entrance-style questions. The sessions were led by experienced faculty members, including Ms. Milagrina D'Souza, Dr. Mira Parmekar and Dr. Johnross Albuquerque, as well as guest resource persons: Mr. Velicio Abranches, Ms. Goutami R. Pilankar, Ms. Rachana R. Raul, Ms. Saniya Kovtankar, Ms. Cyzel D'Souza and Ms. Saloni Mandrekar





The program's structured approach and relevance of content received positive feedback from participating students, who appreciated the clarity and motivation gained from attending the sessions. The training included mock tests, time management strategies, and revision sessions, ensuring students were well-prepared for the GU-ART examination. In total, 30 students benefited from this activity, which undoubtedly enhanced their chances of success in the entrance examination.











**Dorothy Crowfoot Hodgkin** (12 May 1910 – 29 July 1994)

"Captured for life by chemistry and by crystals," as she described it, Dorothy Crowfoot Hodgkin turned a childhood interest in crystals into the ground-breaking use of X-ray crystallography to 'see' the molecules of penicillin, vitamin B12 and insulin.

Her work not only allowed researchers to better understand and manufacture life-saving substances, it also made crystallography an indispensable scientific tool. She was awarded the Nobel Prize in Chemistry in 1964.



Learn more: <a href="https://bit.ly/2VEXNvx">https://bit.ly/2VEXNvx</a>







Green Initiatives and Environment Monitoring Cell in collaboration with Departments of Political Science, Chemistry, Commerce and Geography organised a talk on 15<sup>th</sup> October 2024, to commemorate International E-waste day held on 14<sup>th</sup> October.

The topic of the talk was "Reboot the Earth". Mr. Ashley Delaney, Proprietor of Group TenPlus, Recycling and IT consultant was the resource person.

Two sessions were held at 9:30 – 10:30 a.m. and 10:45 – 11:45 a.m. for the



students of the college. The objective of the talk was to sensitise the students on E-waste management and ways to dispose obsolete E-waste equipment in an environmentally friendly manner. Ms. Kathleen Pinto (H.O.D) co -ordinated from the Department of chemistry.





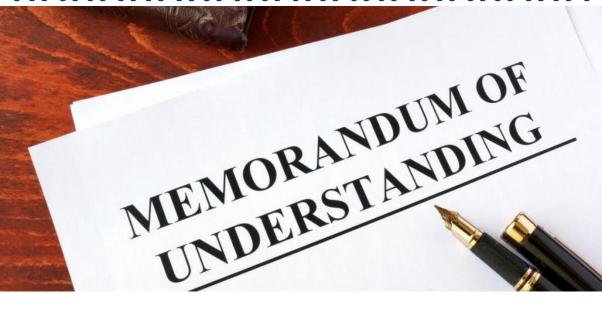


10 SY Major Students completed internship at various leading pharmaceutical company, gaining invaluable hands-on experience in the field. During their tenure, they worked closely with industry professionals in research and development, quality control, and production processes.



The internship provided them with a unique opportunity to learn about analytical instruments such as HPLC, while also gaining insights into pharmaceutical technology and regulatory standards. By bridging the gap between academic learning and real-world application, this experience will undoubtedly prove beneficial for their future careers. The programme was successfully coordinated by Internship incharge Mr. Clarence Rodrigues from the Department of Chemistry and supported by Ms. Kathleen Pinto, HoD, Department of Chemistry.





The Department of Chemistry at St. Xavier's College, Mapusa, Goa, has signed a Memorandum of Understanding (MOU) with Glenmark Pharmaceuticals Limited on February 14, 2025. This significant partnership aims to foster collaboration and mutual benefit in areas of research, education, and industry-academia partnership.

Through this MOU, the Department of Chemistry looks forward to a fruitful and productive partnership with Glenmark Pharmaceuticals Limited, exploring opportunities for joint research projects, student internships, and faculty development. This collaboration is expected to enhance the department's research capabilities, provide industry insights to students, and contribute to the growth of the pharmaceutical sector. The signing of the MOU was coordinated by Dr. Andrew D'Souza.







St. Xavier's College celebrated National Science Day 2025 with a one-day collegiate program themed "Public Trust in Science" and "Empowering Indian Youth for Global Leadership in Science and Innovation for Viksit Bharat". The event aimed to promote scientific awareness, recognize Indian contributions to science, and inspire youth participation.

The keynote address was delivered by Prof. Shrivallabh Kamat, a retired Professor of Organic Chemistry, who spoke on "Interesting Demos and Hands-on Activities in Chemistry Using Microscale Techniques". The session was engaging and informative, showcasing experiments that align with sustainable development goals.







The event also featured various competitions, including ScienceMarvels, a fancy dress competition honoring men and women in science; ScienceQuest, a multilevel science quiz; ScienceStreet, a street play highlighting the theme "Public Trust in Science"; ScienceExpo, a science exhibition focusing on sustainable innovations for a developed India; and ScienceBuzz, research presentations showcasing the scientific temper of the department.





The prize winners were announced, with notable performances from students in various categories. Special felicitations were also given to excelled students who Chemistry at both collegiate and intercollegiate levels, including winners of the Annual TYBSc Chemistry Quiz and Intercollegiate Oral Quiz Competition on Green Chemistry & Laboratory Safety.

concluded with The event meritorious students receiving trophies and certificates, and the college's administration expressed support for the celebration's grand success. Acting Principal Ms. Ursula Barreto, Principal In-charge Prof.

Filip Rodrigues e Melo, and Administrator Fr. Antonio Salema congratulated the Department of Chemistry on a successful event.







As part of the National Science Day celebrations, the college organized an Open Lab Day with the theme "Building Public Trust in Science" for neighboring schools. The event saw participation from four schools: St. Britto's, Mapusa; Saraswat Vidyalaya, Mapusa; Holy Cross High School, Siolim; and St. Francis Xavier High School, Siolim.



The SYBSc Major students from the Chemistry department, guided by Dr. Mira Parmekar, set up several chemistry experiment demos to spark curiosity among the school students about chemistry and science. The demos included:

- Introduction to Fascinating World of Chemistry by Dr. Mira Parmekar
- Chameleon Reaction by Ms. Fatima Sheikh, Ms. Utkarsha Kotkar, Ms. Pradnya Shetye, and Ms. Shruti Salgaonkar
- Magic Indicator by Ms. Aslesha Dhargalkar, Ms. Apoorva Mahadeshwar, Ms. Natasha Phadte, and Ms. Mitali Shetgaonkar
- Extraction of Essential Oil by Ms. Tamanna Sheikh (TYBSc), Ms. Trisha Adhikari,
   Ms. Suyash Shetgaonkar, and Mr. Tejas Kundaikar.

The school students were thrilled to witness the demos, and the accompanying teachers appreciated the effort put in by the college students and faculty. The event

was smoothly conducted with the support of Ms. Kathleen Pinto, Head of the Chemistry Department.







# **NOBEL PRIZE LAUREATE SECTION**

# Richard Henderson (19 July 1945)

Richard Henderson is a British molecular biologist and biophysicist and pioneer in the field of electron microscopy of biological molecules. Henderson shared the Nobel Prize in Chemistry in 2017 with Jacques Dubochet and Joachim Frank. Because of his work, we can look at individual atoms of living nature, thanks to cryo-electron microscopes we can see details without destroying samples, and for this he won the Nobel Prize in Chemistry.



"One of the most important things as a scientist is that you have to be an optimist. If you're a pessimist, a failed experiment will tell you that the whole idea is bad and you'll quit. When you fail you have to continue."

~ Richard Henderson's advice to young scientists.



# 30th August 2024-

Six students from the Department of Chemistry recently participated in the Cosmopharma workshop, gaining valuable insights into the pharmaceutical and cosmetics industries. The workshop consisted of two sessions: "Future of Medicine: Trends and Insights from the Pharmaceutical" and "Cosmeticology and Herbalism: A Synergistic Approach to Sustainable Beauty."

The first session explored recent trends in the pharmaceutical industry and novel instrumentation methods for analyzing Active Pharmaceutical Ingredients (APIs). The second session focused on product formulation and safety guidelines in the cosmetics

industry, highlighting the importance of sustainable practices and herbalism in beauty products.

This workshop provided students with a comprehensive understanding of cosmetics formulation, dissolution, and disintegration studies, bridging the gap between theoretical knowledge and industry applications. The experience is expected to benefit their future careers in the pharmaceutical and cosmetics sectors.





# 5th October 2o24

Ms. Milagrine D'Souza along with students attended a One- Day Certificate Workshop on the theme "Unleashing Research Potential: Laboratory to Industry" organised by the Post Graduate Department in Analytical Chemistry of Parvatibai Chowgule College of Arts and Science (Autonomous), Margao- Goa.

# Parvatibai Chowgule College of Arts and Science AUTONOMOUS

# 7th October 2024

The chemistry department of St. Xavier's College, Mapusa – Goa, organized a

session on soil sampling for FY BSc students. The session was led by Assistant Professor Mr. Satish Patel from the College of Agriculture. The session covered the importance of soil sampling, its components, and techniques for collecting samples.





After the presentation, students asked questions, which were answered in detail. A practical session followed, where students learned hands-on soil sampling techniques. The practical demonstration involved collecting soil samples from different points in a zigzag manner, mixing and dividing the samples, and finally reducing them to a small representative sample. The event concluded with a group photo and a vote of thanks.

The program was organized by Dr. Rheane Da Silva under the guidance of Ms. Kathleen Pinto.

# **NOBEL PRIZE LAUREATE SECTION**

Akira Yoshino (30 January 1948, age: 77 years)

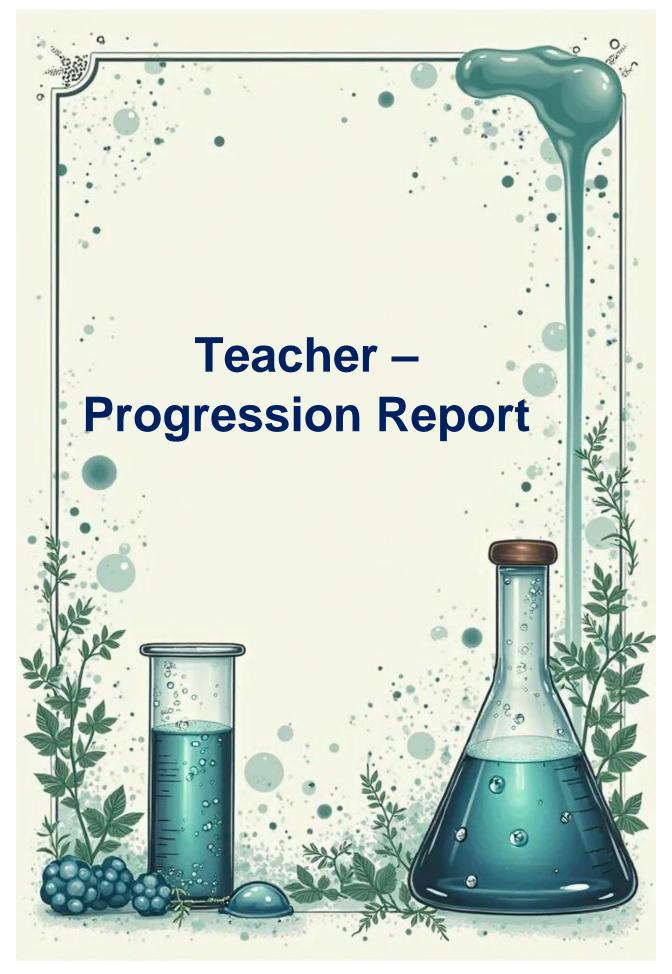
Yoshino's interest in chemistry was sparked when he received a copy of Michael Faraday's book 'The Chemical History of a Candle'. After studying technology at Kyoto University, he ultimately ended up developing the first commercially viable lithium-ion battery in 1985. These types of batteries are now used in everything from mobile phones to laptops and electric vehicles. Lightweight and rechargeable, they can also store significant amounts of energy from solar and wind power, making possible a fossil fuel-free society.

He was awarded the Nobel Prize in Chemistry 2019 alongside John Goodenough and Stanley Whittingham "for the development of lithium-ion batteries."





Photos: Akira Yoshino aged 5; Akira Yoshino at the Nobel Prize Museum in 2019



# 24th July 2024

Chemistry faculty members Mr. Mahesh Nair and Mr. Clarence Rodrigues participated in the Progress Review Workshop titled "Creation of Conceptual Models/Demonstration for Enhanced Learning in Chemistry" for Chemistry Faculty Trained at IISc Challakere. The workshop was held at the Directorate of Higher Education, Porvorim, Goa.



During the workshop, Mr. Nair and Mr. Rodrigues presented innovative ideas for classroom implementation, focusing on creating conceptual models and demonstrations to enhance learning in chemistry. Their presentations aligned with the National Education Policy (NEP) syllabus and showcased practical demonstrations that can be adopted across colleges in Goa, promoting effective teaching and learning practices in chemistry.

# 23rd August 2024

Dr. Mira Parmekar and Dr. Rheane Da Silva attended the Indo-German Conference on Green Chemistry.



# 26th - 27th August 2024

Ms. Milagrina D'Souza participated in a Two-Day Workshop on Raman Spectroscopy organised by SCS & SPAS, Goa University funded by DST-PURSE.



# 24th - 25th September 2024

Three faculty members (Ms. Janesline Fernandes, Dr. Mira Parmekar and Mr. Clarence Rodrigues) from the Department of Chemistry recently participated in the international "Green conference Energy: Powering a Sustainable Future," organized by the Department of Chemistry and Cluster Research Centre in association with Ibaraki University, Japan. The two-day conference focused on key topics such as:



- Energy from biomass and biofuels
- Solar and wind energy, energy transmission, distribution, and storage
- Energy sustainability

The conference featured presentations bv eminent scientists from Japan and India, as well as oral and poster presentations from participants. Notably, Dr. Mira Parmekar won 2<sup>nd</sup> place poster for her presentation on green catalysis, showcasing her research expertise in sustainable chemistry. The conference provided a platform for the faculty members to engage with international experts, share their research, and gain insights into the latest developments in green energy.



# 25<sup>th</sup> September 2024

Ms. Milagrina D'Souza attended webinar on "Accelerating Density Functional Theory for Faster Calculations," by Dr. Alexis Mills, Senior applied scientist for Azure

Quantum.

# 4th - 5th October 2024

Ms. Janesline Fernandes presented a poster at National Symposium on Frontiers in Heterogeneous Catalysis (HETCAT – 2024) at M. S. University of Baroda, Vadodara, Gujarat.

# 23rd - 24th October 2024

Ms. Janelsine Fernandes, Dr. Andrew D'Souza and Ms. Milagrina D'Souza



participated in Goa University Crystallography Workshop – 2024 (GUCW-II) which was a DST-PURSE funded Two-days National level workshop on Materials Characterization using Powder X-ray Diffraction at School of Chemical Sciences, Goa University.

### 6th November 2024

Ms. Milagrina D'Souza attend a Virtual workshop on "Sub-ambient studies by Agilent's Cary 60 Uv-vis with Unisoku coolspek accessory" Dr. Sayantan Paria, Department of Chemistry, Indian Institute of Technology, Delhi.

# 8th November 2024

Ms. Janesline Fernandes participated in "Igniting Curiosity: a one day symposium on Advanced Science for Young Researchers" held at Goa University organized by School of Chemical Sciences, GU and Indian National Young Academy of Science.

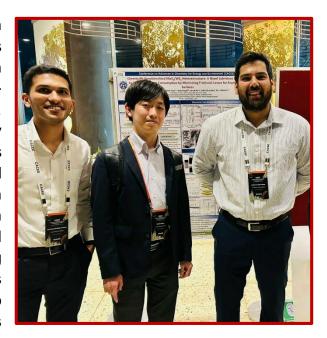
# 16th - 20th December 2024

Dr. Andrew had the privilege of enthusiastically participating and presenting research work, "Perovskite Solar Cells: Addressing Degradation Mechanisms & Scaling Up Commercialization through Innovative Materials and Manufacturing," through an offline poster presentation at the International Conference on Advances in Chemistry for Energy and Environment (CACEE-2024).

Held from December 16th to 20th, 2024, at the Tata Institute of Fundamental Research (TIFR) in Mumbai, India, this prestigious event brought together global experts and researchers to share knowledge and collaborate on advancing novel material design, synthesis, and mechanistic understanding. The conference provided an invaluable

platform for academic and professional growth, featuring plenary lectures, keynote addresses, and invited talks by esteemed researchers.

Dr. Andrew was thrilled to interact with thought leaders and researchers worldwide, gaining fresh perspectives on addressing environmental and energyrelated challenges through chemistry. Dr. Andrew is grateful for the opportunity to present the research and looks forward to applying the knowledge and ideas gained to advance the research and explore potential collaborations with fellow researchers. This experience will contribute to undoubtedly academic endeavors at St. Xavier's College, and Dr. Andrew is excited to build upon the insights and connections made during CACEE-2024.



# 11<sup>th</sup> – 18<sup>th</sup> February 2025

Ms. Milagrina D'Souza and Mr. Clarence Rodrigues attended a Faculty Development Program: An Inter-disciplinary FDP on preparing teachers for Participation in Community Service Programmes as envisaged in NEP 2020 on Cancer Awareness.

# 20 - 21<sup>st</sup> February 2025

Goa University, in collaboration with the Bharatiya Bhasha Samvardhan Samiti (BBSS), organised a two-day face-to-face workshop for all textbook writers who had submitted proposals, as well as those interested in submitting proposals to write Konkani language textbooks for the Sciences, Commerce, and Arts streams, as nominated from the respective colleges.

Five resource persons from BBSS were present at Goa University to provide guidance on textbook writing, along with several Konkani language experts and mentors. The workshop took place in the Conference Hall of the Administrative Building at Goa University on the 20<sup>th</sup> and 21<sup>st</sup> of February 2025, starting at 10 am on both days.

The event marked a significant step in providing teaching and learning material in the Konkani language for undergraduate students. It also represented a major advancement in the development of Konkani as a medium for diverse academic disciplines.

During the workshop, authors received valuable assistance from Konkani language experts to support their textbook writing efforts.



# 6th March 2025

Ms.Kathleen Pinto, Head Department of Chemistry attended the Meet and presented a Poster on" An ecofriendly catalyst for the synthesis of Biscoumarins and study of it's quorum quenching potential" at the Research Scholar Meet organized by Goa State Higher Education Council, Directorate of Higher Education, Vidnyan Dhara 2025 on 6th March 2025 at Multipurpose Hall ,Sanskruti Bhavan.



# 21st - 26th April 2025

Ms. Janesline Fernandes participated in a six-day online FDP on 'Recent Advances in Chemistry and Materials Science' organized by Department of Humanities and Sciences (Chemistry).

# All faculty members participated in:

- National Level FDP on Holistic Learning for Excellence in Higher Education', organized by Internal Quality Assurance Cell (IQAC), St. Xavier's College from 22<sup>nd</sup> October 2024 to 26<sup>th</sup> October 2024.
- One-Day State Level FDP on "Advancing Excellence in Higher Education: Innovation and Global Perspectives" on 30<sup>th</sup> January 2025.
- FDP on 'Quality in Higher Education' organized by Internal Quality Assurance Cell (IQAC), St. Xavier's College from 15<sup>th</sup> April 2025 to 17<sup>th</sup> April 2025.

# **VIDNYAN DHARA SESSIONS**

# Dr. Mira Parmekar

Delivered a total of 4 sessions on **Learning Chemistry: The Fun Way**:

- 22<sup>nd</sup> January 2025 at St. Anthonys HS, Duler
- 23<sup>rd</sup> January 2025 at Shri Vijayanand Higher Secondary School, Mayem, Bicholim and Government High School, Kudchire, Bicholim Goa.
- 27<sup>th</sup> January 2025 at St. Rita's High School, Colvale, Mapusa Goa.



@ Duler on 22<sup>nd</sup> January 2025



@ Kudchire on 23<sup>rd</sup> January 2025



@ Mayem on 23rd January 2025



@ Colvale on 27th January 2025

# Ms. Milagrina D'Souza:

Delivered a session at St. Francis Xavier HS, Mapusa-Goa on the theme 'Exploring the world of Chemistry' on 8<sup>th</sup> February 2025.



# Mr. Clarence Rodrigues:

Delivered a session at Gera School, Kadamba Plateau, Tiswadi on 21<sup>st</sup> Feb 2025 on the topic 'Science and its impact'.



# **PUBLICATION**

**Milagrina D'Souza**, Nikita N. Harmalkar, Vishnu R. Chari, Beena K. Vernekar, Sunder N. Dhuri, *Bis(4-aminopyridinium) and bis(2-amino-6-methylpyridinium) cations stabilised by [MS4]2- anions: Synthesis, crystal structures, Hirshfeld surface analysis and sulfur transfer reactions, Polyhedron, Volume 265, 2025, 117272, ISSN 0277-5387, <a href="https://doi.org/10.1016/j.poly.2024.117272">https://doi.org/10.1016/j.poly.2024.117272</a>.* 

# RESEARCH PROJECTS

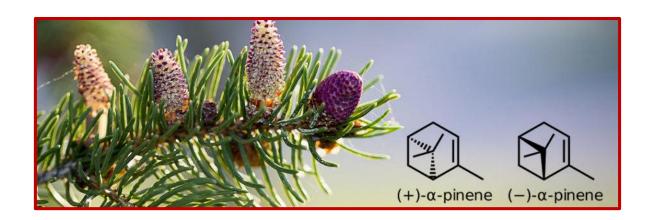
Dr Pramod Sawant Honourable Chief Minister of Goa Inaugurated the Goa University Research Park Unit-GURU (UniGoa Knowledge and Innovation Foundation) and presented the Sanction letters to Team Leader Dr Andrew Dsouza under the Hand Holding & Start-Up Scheme 2023-24 by Directorate of Internships, Incubation and Industry in Partnership with Goa University.



Dr, Andrew D'Souza got funding for several projects which are summarized below.

Funding Agency	Topic	Period	Funding Amount
Department of Science and Technology Delhi (PURSE) Delhi, Goa University Hand holding and Start up scheme 2023-24	Natural dyes from flowers of Goa	2024- 2025 (Ongoing)	Rs. 37,500 /-
Department of Science and Technology Delhi (PURSE) Delhi, Goa University Hand holding and Start up scheme 2023-24	Coconut shell waste as a raw material to produce compressed coconut shell sheets and Wood Substitute Material by using environmentally friendly adhesives	2024- 2025 (Ongoing)	Rs. 37,500 /-
Department of Science and Technology Delhi (PURSE) Delhi, Goa University Hand holding and Start up scheme 2023-24	Tissue Culture of Goa GI Moira Banana	2024- 2025 (Ongoing)	Rs. 75,000 /-
GSRF Project	Integrated Management of Red Palm Weevil: Elucidating Coconut Varietal Resistance and Evaluating Stimulo- Deterrence Properties of Native Flora for Sustainable Agriculture in Goa	2024- 2025 (Ongoing)	Rs. 3,49,500 /-







# 24th August 2024

Chemistry students won 1st place at Atomica 2024 organized by Carmel College of Arts & Science, Nuvem, Goa.



# 29th January 2025

T.Y.BSc. Chemistry students Mr. Vedant Pilankar and Ms. Tamanna Shaikh accompanied by Dr. Mira Parmekar from the Department of Chemistry, participated in an Intercollegiate Oral Quiz Competition on the topic "Green Chemistry and Laboratory safety for better sustainability" Organized by Green Club, Department of Chemistry Dnyanprassarak Mandal's College and Research Centre, Assagao.

The two-student team participated in the quiz where altogether 09 teams from different Science colleges also took part. Mr. Vedant Pilankar and Ms. Tamanna Shaikh emerged as the **Winners** of the Intercollegiate Competition. The students were mentored by faculties Dr. Mira Parmekar and Dr. Rheane Da Silva who handle the T.Y.BSc. Green Chemistry paper. They really enjoyed the quiz. Head of the Department Ms. Kathleen Pinto played a key role in encouraging and motivating the students to participate in the Quiz.



# 8<sup>th</sup> February 2025

The 22<sup>nd</sup> Annual Convention cum Workshop of the Association of Chemistry Teachers (ACT-Goa) was held on February 8, 2025, at Goa University. The event featured invited lectures by renowned researchers, aiming to inspire students and teachers. A student from St. Xavier's College, Ms. Saniya Sandesh Kovtankar, was felicitated for being the topper in BSc Chemistry at Goa University.



The convention brought together over 150 delegates, including teachers, professors, and researchers. Faculty members from St. Xavier's College, Dr. Andrew D'Souza, Dr. Mira Parmekar, and Ms. Milagrina D'Souza, attended the event.



# 25<sup>h</sup> February 2025

S.Y.BSc. Major Chemistry students, Ms. Michele Barreto and Mr. Sudhanshu Harlankar, from St. Xavier's College, Mapusa, achieved a remarkable 3<sup>rd</sup> place at the Intercollegiate Oral Presentation Competition on Science Experiential Learning in Konkani. The competition was held at Ganpat Parsekar College of Education, Harmal, as part of National Science Day celebrations.



The event also featured a thought-provoking seminar on "Unlocking the Secrets of Nature: Natural Products in Modern Medicine." Their achievement is a testament to their hard work and dedication. The students were trained under the guidance of Dr. Mira Parmekar, Ms. Milagrina D'Souza and Mr. Clarence Rodrigues.



# 8th March 2025

School of Chemical Sciences, Goa University in association with Chemistry Department Faculty and Alumni Association (CDFAA), Goa University organised 17<sup>th</sup> Annual One Day Symposium on the theme, <u>'Fascinating World Of Chemical Sciences"</u> for the T. Y. B.Sc. Chemistry Students of Science Colleges in Goa on Saturday, 08<sup>th</sup> March 2025. This Symposium gives an opportunity to the T. Y. B.Sc. Chemistry students from all over the state to participate and present their T.Y. B. Sc. project work in the symposium. Shri Vinay J. Manerikar, Deputy GM – QC Dept., Zydus Lifescience Ltd, Kundaim-Goa was the Chief Guest of the function. The venue for the event was Auditorium, School of Chemical Sciences, Goa-University and Dr. Rohan Kunkalekar was the Convener for the event.

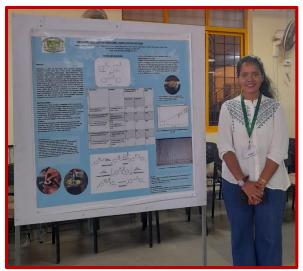


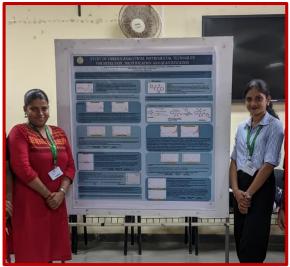
All together 16 of our Third Year students had participated in the event along with 2 faculty members who were guiding these students for their projects. The Competition here occurs in two categories of which Ms. Simran F. Shaikh secured 2<sup>nd</sup> Place in the oral presentation for his project work titled "Sustainable Dyes from indigenous Goan flora" guided by Dr. Mira Parmekar.

Ms. Jamira Mendonca and Ms. Ritusha Palyekar also presented their project work carried out under the guidance of Ms.



Kathleen Pinto and Dr. Andrew D'Souza respectively for the Poster competition. Later, all the students were taken around to show the department's instrumental facilities by the accompanying teachers. Overall, it was a very enriching experience for the students. We appreciate the efforts of Ms. Kathleen Pinto, HoD Chemistry for her support and encouragement to participate in the event.







# 5th -7th March 2025

The TY project "Sustainable pigments from Indigenous Goan flora - A study" was one of the top 12 entries selected at KALPAK, a state-level Science Exhibit Showcase, as part of Vidnyan Dhara 2025. Held over three days (March 5-7, 2025) at the Exhibition Gallery, Directorate of Art & Culture, Sanskruti Bhavan, Patto, Panaji, Goa, the event provided a platform for the team to showcase their innovative work.

The team, consisting of Ms. Simran Firoj Shaikh, Ms. Saishma Prasanna Naik, Ms. Samiksha Sushant Anvekar, and Ms. Sampada Vishnu Naik, was guided by Dr. Mira Vinayak Parmekar, Assistant Professor, Department of Chemistry, St. Xavier's College, Mapusa. The project represented St. Xavier's College at the *Goa Science Exhibition under Vidnyan Dhara 2025, and the team had the* opportunity to interact with fellow science enthusiasts, learn from inspiring projects, and engage with officials and visitors.



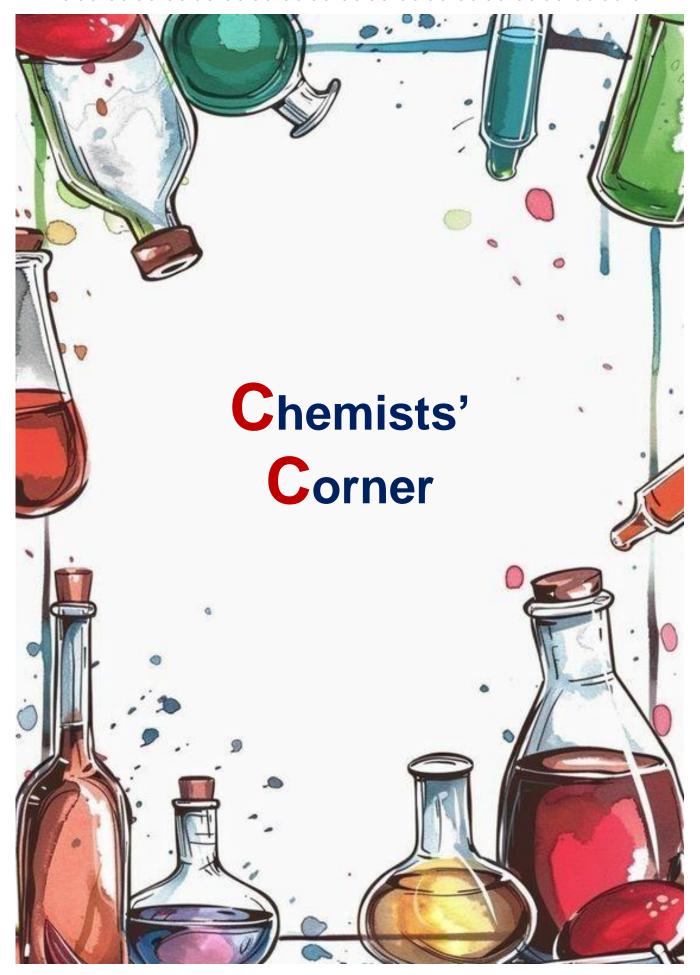
The event was well-organized by Prof. Vithal Tilvi, Dr. Mahesh Majik, and team members, with over 500 students visiting the exhibit over the three days. The experience not only enriched the students' knowledge but also motivated them to pursue scientific inquiry with greater passion. The team's participation in KALPAK was

an incredible experience that deepened their understanding of scientific concepts and fostered a spirit of innovation and exploration.





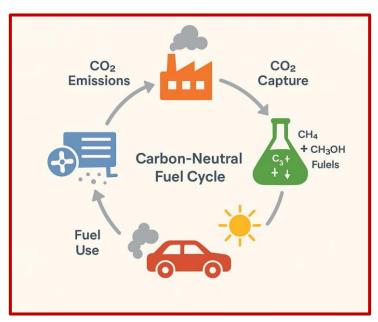




# TURNING CARBON DIOXIDE INTO FUEL: ENGINEERING A CARBON-NEUTRAL FUTURE

Carbon dioxide is often seen as a waste product – an unwanted byproduct of burning fossil fuels and one of the leading drivers of climate change. But a growing body of scientific work is flipping that view on its head. What if, instead of treating CO<sub>2</sub> as a problem to bury underground, we could transform it into a solution – by turning it into fuel?

This concept lies at the heart of emerging carbon recycling technologies. Using renewable energy, CO<sub>2</sub> can be converted



into fuels like methane, methanol, or synthetic hydrocarbons. These fuels could power vehicles, heat buildings, or serve as feedstocks for industry – all while helping reduce net greenhouse gas emissions.

# Why CO<sub>2</sub> as a Fuel Source?

CO<sub>2</sub> is the final product of combustion—a stable molecule that's notoriously hard to break apart. But stability is only part of the story. With the right input of energy and the help of advanced catalysts, CO<sub>2</sub> can be "re-energized" into something useful.

The key is closing the carbon loop. Instead of releasing fossil CO<sub>2</sub> into the atmosphere and never reclaiming it, carbon recycling technologies aim to capture CO<sub>2</sub> and convert it back into energy-rich compounds. This process doesn't eliminate CO<sub>2</sub> altogether, but it helps maintain a balance—especially when powered by solar, wind, or other renewables.

# Main Methods of CO<sub>2</sub>-to-Fuel Conversion

# 1. Thermochemical Conversion

In this method, CO<sub>2</sub> is chemically reacted with hydrogen (H<sub>2</sub>) or methane (CH<sub>4</sub>) at high temperatures to produce syngas—a mix of carbon monoxide (CO) and hydrogen. This syngas can be further processed into methanol, gasoline, or diesel-like fuels through established industrial processes like Fischer–Tropsch synthesis.

- Dry Reforming of Methane (DRM): Combines CO<sub>2</sub> and CH<sub>4</sub> to create syngas
- Reverse Water–Gas Shift Reaction: Converts CO<sub>2</sub> and H<sub>2</sub> into CO and water

These processes require high temperatures and carefully designed catalysts, but they are efficient and scalable.

# 2. Hydrogenation to Methane or Methanol

Another option is reacting CO<sub>2</sub> directly with hydrogen to create fuels like methane (CH<sub>4</sub>) or methanol (CH<sub>3</sub>OH). This is typically done under high pressure and moderate heat.

The Sabatier Reaction, for example, produces methane and water.

Methanol synthesis requires slightly different catalysts and conditions but is already used in industry. This method is particularly attractive when paired with green hydrogen — hydrogen produced using renewable electricity — because it allows for long-term energy storage in chemical form.

# 3. Solar-Driven (Photochemical) Conversion

Mimicking the process of photosynthesis, photocatalysis uses sunlight to drive the conversion of  $CO_2$  into fuel. Specialized materials, such as titanium dioxide ( $TiO_2$ ) with metal dopants, absorb sunlight and use the energy to split water and reduce  $CO_2$  into small fuel molecules like formic acid, methanol, or methane.

Although promising, current solar-to-fuel efficiencies are still low. Research continues into better light-absorbing materials and more durable catalysts to make this a viable large-scale option.

# The Role of Catalysts and Materials Science

No matter the method, one of the biggest challenges in CO<sub>2</sub> conversion is the need for effective catalysts—materials that accelerate chemical reactions without being consumed. These must be:

- Highly active, to make reactions faster.
- Selective, to produce the desired fuel.
- Stable, to last through many cycles of use.
- Nanostructured metals, metal oxides, and ionic liquids are all being studied for their ability to activate CO<sub>2</sub> and steer it toward useful outputs.

# **Sustainable Energy Meets Carbon Recycling**

For CO<sub>2</sub>-to-fuel technologies to be truly beneficial, they must run on renewable energy. Using coal or gas to power CO<sub>2</sub> conversion would only shift the emissions from one place to another. That's why most current research focuses on integrated systems that pair solar, wind, or hydroelectric energy with fuel synthesis—essentially turning excess electricity into liquid or gaseous fuels for storage and transport.

These synthetic fuels can:

- Serve as carbon-neutral replacements for gasoline or natural gas.
- Be stored and used on demand, helping to balance energy grids.

• Reduce the need for fossil fuel extraction

# Circular carbon economy

The ultimate goal is a circular carbon economy, where CO<sub>2</sub> is never wasted. It's captured from power plants, industry, or even the air, and reused to make fuels, chemicals, and

materials. This not only cuts emissions but helps create a more resilient, sustainable energy system.

Today, demonstration plants are already producing methanol and synthetic diesel from CO<sub>2</sub> using renewable hydrogen. As technology scales and costs fall, this approach could become a cornerstone of global climate strategy.

# **Conclusion**

Turning carbon dioxide into fuel isn't science fiction—it's a real, developing strategy for building a sustainable future. With the help of innovative chemistry, materials science, and renewable power,  $CO_2$  can be transformed from a climate threat into a valuable resource. The next generation of fuels may not come from oil wells but from the very air around us.

# \* Fascinating Fact:

In one cutting-edge experiment, scientists successfully turned CO<sub>2</sub> into diamonds by recreating the extreme conditions found deep within Earth's mantle!



Ms. Gavravi Chari (T.Y.BSc. Chemistry student 2025-2026)



# **Green Chemistry: Cleaning Up the Future of Science**

As the world battles climate change, plastic pollution, and toxic industrial waste, scientists are looking for new ways to protect the planet. One of the most powerful tools in this fight is Green Chemistry — a revolutionary field that's changing how we think about science, industry, and sustainability.

While chemistry has given us life-saving medicines, high-tech materials, and countless comforts of modern life, it has also contributed to environmental damage through

hazardous chemicals, waste generation, and excessive energy use. Green Chemistry aims to change that.

# **What is Green Chemistry?**

Green Chemistry is the science of designing chemical products and processes that reduce or eliminate hazardous substances. Rather than treating pollution after it occurs, this approach prevents it at the source. It's chemistry with a conscience.

This eco-friendly movement began in the 1990s when scientists like Paul Anastas and John Warner realized that innovation didn't have to come at the cost of the environment. Since then, it has spread into nearly every area of chemistry—from pharmaceuticals to plastics.

# 12 Guiding Principles

At the heart of Green Chemistry are 12 principles, which include using renewable materials, designing safer chemicals, avoiding waste, and increasing energy efficiency. These principles encourage scientists to "design out" hazards before they appear.

For example, instead of using petroleum-based plastics, chemists now explore biodegradable alternatives made from corn starch or algae. Instead of toxic solvents, water and even carbon dioxide are being used in newer chemical reactions.

# **▲** Real-World Applications

Green Chemistry isn't just an idea — it's already making an impact:

Medicine: Drug companies are reducing waste and using safer reagents. Pfizer, for instance, used Green Chemistry principles to improve the production of the antidepressant Zoloft, reducing waste by 80%.

Energy: Researchers are developing biofuels and solar-powered reactions to replace fossil fuels. Some even mimic photosynthesis to split water and generate hydrogen.

Everyday Products: From biodegradable packaging to eco-friendly detergents, many consumer items are going green.

Food and Agriculture: Natural pesticides and fertilizers are being developed to reduce harm to soil and water.

# A Greener Lab, A Greener World

Even in college labs, students can start applying these ideas—by choosing safer reagents, reducing solvent use, and handling waste responsibly. Green Chemistry encourages a shift in mindset, where safety and sustainability are priorities—not afterthoughts.

# Challenges Ahead

Still, Green Chemistry is not without obstacles. Many green alternatives are more expensive or less efficient than traditional methods. Some industries are slow to change. But as technology advances, these hurdles are slowly being overcome.

# The Future is Green

The global climate crisis has made it clear: we can no longer afford to pollute now and clean up later. Green Chemistry offers a sustainable path forward, blending innovation with responsibility.

As young scientists and future leaders, it's time we ask ourselves: can we make chemistry not only smart but also safe? With Green Chemistry, the answer is yes.



Mr. Soham Kauthankar (T.Y.BSc. Chemistry student 2025-2026)



# Catalysts in Chemistry: The Key to Faster and Greener Reactions

### Introduction

In the world of chemistry, speed and efficiency are everything. Whether it's making medicines, refining fuels, or developing eco-friendly materials, scientists need chemical reactions to happen quickly, selectively, and with minimal waste. Catalysts are the unsung heroes that make this possible.

# What is a Catalyst?

A catalyst is a substance that speeds up a chemical reaction without itself being consumed in the process. It works by providing an alternative reaction pathway with a lower activation energy.

☐ Analogy: Think of a catalyst like a shortcut on a mountain trail — it helps you reach the summit (product) faster without climbing the full height (activation energy).

# **Types of Catalysts**

Homogeneous Catalysts: These are in the same phase (usually liquid) as the reactants. Example: Acid catalysis in esterification.

Heterogeneous Catalysts: These are in a different phase (usually solid) than the reactants. Example: Iron catalyst in the Haber process  $(N_2 + H_2 \rightarrow NH_3)$ .

**Biocatalysts (Enzymes)**; Biological molecules that catalyze reactions in living organisms. Example: Amylase breaks down starch into sugar in saliva.

# **Industrial Importance**

Catalysts are vital in many industries:

- 1. Petroleum refining cracking hydrocarbons using zeolites.
- 2. Fertilizer production Haber-Bosch process using iron catalysts.
- 3. Pharmaceuticals asymmetric catalysis for drug synthesis.
- 4. Green chemistry reducing waste and energy use.

# **Modern Advances**

Recent research is focused on:

- 1. Nano-catalysts extremely efficient due to high surface area.
- 2. Photocatalysts use light to drive reactions (e.g., splitting water into hydrogen).
- 3. Enzyme engineering modifying natural enzymes for industrial use.

# **Environmental Impact**

Catalysts are crucial in making chemical processes more sustainable:

- ✓ Less energy needed
- ✓ Lower emissions
- ✓ Reduced use of toxic reagents

One key example is catalytic converters in cars, which reduce harmful gases like NO<sub>x</sub> and CO into less harmful substances.

### Conclusion

Catalysts are the backbone of modern chemistry, enabling faster, cleaner, and more economical reactions. As the world shifts toward sustainable practices, the role of catalysts will become even more critical — helping us build a greener and more efficient future.





Mr. Tejas Kundaikar & Mr. Aniket Parsekar (T.Y.BSc. Chemistry students 2025-2026)



# DAILY CHEMISTRY Secret Chemistry of Simple Things

# Ever felt a sudden headache while eating ice cream?

That's called brain freeze, and it's real! It happens when something super cold hits the roof of your mouth. The nerves there get confused and send pain signals to your head. Your brain thinks your forehead is freezing — weird, right? It's actually because of quick changes in blood flow. Pressing your tongue on the roof of your mouth can help. So next time, enjoy your ice cream slowly — your brain will thank you!



# Ever wonder why hair gets frizzy?

It's actually because of chemistry. When hair is dry, it pulls moisture from the air, messing up the bonds in our hair. That's what causes the frizz. Conditioners help by forming a layer that locks in moisture and smooth the strands. Some even release tiny charged particles that make hair feel soft and calm. Science really does play a role in beauty!



# Why do onions make us cry?

It's actually because of chemistry! When we cut an onion, it releases a gas that reacts with our eyes and turns into a mild acid. That's what causes the burning and tears. One easy trick? Just chill the onion before cutting. Cold slows down the reaction, so less gas is released. I tried it — and yes, it really helps!



# Want More Iron from Spinach? Add Lemon!

I found out something cool — spinach has iron, but our body doesn't absorb all of it. It's because of oxalates in spinach that block iron. But if you add lemon (which has vitamin C), it helps your body take in more iron! So next time you make palak, just squeeze a little lemon on it. It's not just for taste — it actually makes it healthier. A small kitchen trick, but with real science behind it. Try it once and you'll feel the difference.



# Why Do We Cry When We're Sad?

I always wondered why we cry when we're feeling low. Turns out, there's actual chemistry behind it! When we're sad, our body releases stress hormones, and crying helps release



some of them. That's why emotional tears are different — they carry out stress chemicals. After crying, we often feel lighter or calmer. It's like the body's natural way to reset. Crazy how even tears have science behind them, right?

"Never thought chemistry was this close to daily life. It's actually there in all the little things we never even notice!"

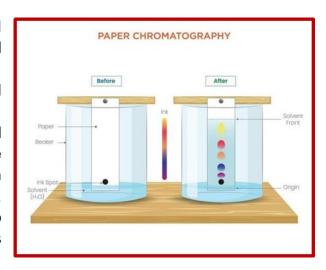


Ms. Aishwarya Gurunath Kasar (T.Y.BSc. Chemistry student 2025-2026)



# **Chromatography: The Art of Separating Molecules**

Chromatography is a powerful analytical technique used to separate, identify, and quantify the components of a mixture. This technique has revolutionized various fields. including chemistry, pharmaceuticals, biology, environmental science. By exploiting the differences in interactions between molecules and a stationary phase, chromatography enables researchers to isolate and analyse complex mixtures with high precision.



# **Principles and Types**

Chromatography works on the principle of differential partitioning, where molecules distribute themselves between a stationary phase and a mobile phase. Various types of chromatography exist, including:

# 1. Paper Chromatography:

Paper chromatography separates compounds based on their differential partitioning between a stationary phase (paper) and a mobile phase (solvent). Compounds move up the paper based on their affinity for the stationary phase versus the mobile phase.

# 2. Column Chromatography:

Column chromatography separates compounds based on their interactions with a stationary phase (solid or liquid) packed into a column. Compounds are separated as they interact differently with the stationary phase and mobile phase.

# 3. Thin Layer Chromatography (TLC):

TLC separates compounds based on their differential partitioning between a stationary phase (thin layer of silica or alumina) and a mobile phase (solvent). Compounds are separated based on their affinity for the stationary phase versus the mobile phase.

# 4. High-Performance Thin Layer Chromatography (HPTLC):

HPTLC is an advanced version of TLC, offering higher resolution and sensitivity. It separates compounds based on the same principles as TLC but uses specialized plates and instrumentation.

# 5. Gas Chromatography (GC):

GC separates volatile compounds based on their boiling points and affinity for a stationary phase. Compounds are vaporized and separated as they interact with the stationary phase in the column.

# 6. High-Pressure Liquid Chromatography (HPLC):

HPLC separates compounds based on their interactions with a stationary phase (solid or liquid) packed into a column. The mobile phase is pumped through the column under high pressure, allowing for high-resolution separation.

# 7. Fast Protein Liquid Chromatography (FPLC):

FPLC separates proteins based on their interactions with a stationary phase designed for protein purification. The technique uses a liquid mobile phase and is optimized for separating biomolecules.

# 8. Supercritical Fluid Chromatography (SFC):

SFC separates compounds using a supercritical fluid (e.g., carbon dioxide) as the mobile phase. The supercritical fluid has properties of both liquids and gases, allowing for efficient separation.

# 9. Affinity Chromatography:

Affinity chromatography separates compounds based on specific interactions between a target molecule and a ligand attached to the stationary phase. This technique is often used for purifying proteins and other biomolecules.

# 10. Reversed Phase Chromatography:

Reversed phase chromatography separates compounds based on their hydrophobic interactions with a non-polar stationary phase. The mobile phase is typically polar, and compounds are separated based on their hydrophobicity.

# 11. Two-Dimensional Chromatography:

Two-dimensional chromatography involves separating compounds using two different chromatographic techniques in sequence. This approach can provide higher resolution and more detailed information about complex samples.

# 12. Pyrolysis Gas Chromatography:

Pyrolysis gas chromatography involves thermally decomposing a sample and then separating the resulting fragments using gas chromatography. This technique is often used for analyzing complex organic materials.

# 13. Counter Current Chromatography:

Counter Current chromatography separates compounds based on their differential partitioning between two immiscible liquids. The technique uses a liquid stationary phase and a liquid mobile phase, which are pumped in opposite directions to separate compounds.

# **Applications**

Chromatography has numerous applications in various industries:

- Pharmaceuticals: purification and analysis of drugs and their metabolites.
- Environmental Science: detection and quantification of pollutants in air, water, and soil.
- Food and Beverage: analysis of flavour compounds, contaminants, and adulterants.
- Biotechnology: purification and analysis of biomolecules, such as proteins and DNA.
- Clinical: Diagnoses diseases and monitors therapeutic drug levels.
- Forensic: Analyses evidence like blood, DNA, and toxic substances.
- Nutraceutical: Ensures quality and purity of dietary supplements.
- Environmental: Detects pollutants and contaminants in air and water.

# **Advantages and Limitations**

Chromatography offers high sensitivity, selectivity, and accuracy, making it an essential tool in many fields. However, it can be time-consuming, requires specialized equipment and expertise, and may not be suitable for all types of samples. Despite these limitations, chromatography remains a crucial technique in many industries.

### **Recent Advances and Future Directions**

Recent advances in chromatography include the development of new stationary phases, improved detection methods, and miniaturization of instruments. These advances have expanded the range of applications and improved the efficiency and sensitivity of chromatographic analysis. As research continues to evolve,

chromatography will likely play an increasingly important role in addressing complex analytical challenges.

# Conclusion

Chromatography is a powerful technique that has transformed the way we analyse and understand complex mixtures. Its applications continue to expand, and ongoing research aims to improve its efficiency, sensitivity, and versatility. As the demand for accurate and reliable analysis grows, chromatography will remain an indispensable tool in various industries and research fields.



**Mr. Sudhanshu Halarnkar** (T.Y.BSc. Chemistry student 2025-2026)

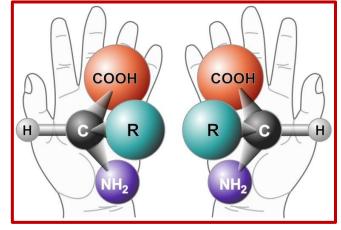


# The Power of Asymmetric Organo-catalysis: A Nobel-Worthy Breakthrough!

Why does ibuprofen ease headaches, and why does ice cream taste sweet? The answer lies in how their chemical components fit perfectly into specific receptors in our bodies. Just like a glove must match the hand, a molecule must fit its receptor precisely

for a drug to work effectively or for a flavor to taste right.

Many molecules exist in two mirrorimage forms – one right-handed, the other left-handed – known as chirality. Your body's receptors can recognize and respond to only one of these forms. A left-handed glove simply won't fit a right hand, and the same principle applies to molecular recognition.



So, how do chemists ensure they create the correct "handed" version of a molecule for medicines to work as intended?

# David MacMillan (Princeton University) and Benjamin List (Max Planck Institute)

were jointly awarded the 2021 Nobel Prize in Chemistry for pioneering a simple yet powerful way to make molecules with the desired orientation. They developed asymmetric organocatalysts – carbon-based catalysts that enable the selective production of molecules in one specific 3-D arrangement. This discovery has

Chirality is like handedness — molecules must shake hands the right way to work in life's chemistry.

- Prof. Ryóji Noyori

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transformed the way chemists design and manufacture safe, effective, and affordable drugs.

Catalysts, in nature or laboratory, speed up chemical reactions by lowering the energy required for them to occur. Traditionally, many asymmetric catalysts relied on precious metals such as palladium or platinum. While effective, these metals can be expensive, toxic, and sensitive to air and moisture – requiring careful handling and removal from final drug products. Asymmetric catalysts differ because they selectively produce either the left-handed or right-handed form of a molecule.

In living organisms, enzymes – massive, complex proteins – assemble molecules with exquisite precision. They are essentially nature's molecular factories, crafting only the correct "hand" of a

molecule. While effective in biology, these enzymes are often enormous compared to the drugs chemists want to make and can be laborious and costly to produce for industrial use.

Today, asymmetric organocatalysts are widely used to produce drugs for cancer, diabetes, HIV, and many other conditions. They have enabled the creation of thousands of new chemical reactions, often using inexpensive, sustainable materials. Because they avoid toxic metals and work in simple laboratory setups, organocatalysts make advanced drug synthesis accessible to chemists worldwide – regardless of budget or location.

As MacMillan himself has said, their power lies in their simplicity, affordability, and sustainability. By placing cutting-edge molecular design into the hands of more scientists, organocatalysis has definitely and rapidly reshaped modern medicinal chemistry.

# More reading

- Asymmetric Catalysis in Organic Synthesis R. Noyori
- Organocatalysis B. List (2021 Nobel Prize in Chemistry recipient)
- Nature Communications (2025), DOI: 10.1038/s41467-025-SPINDOLE



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