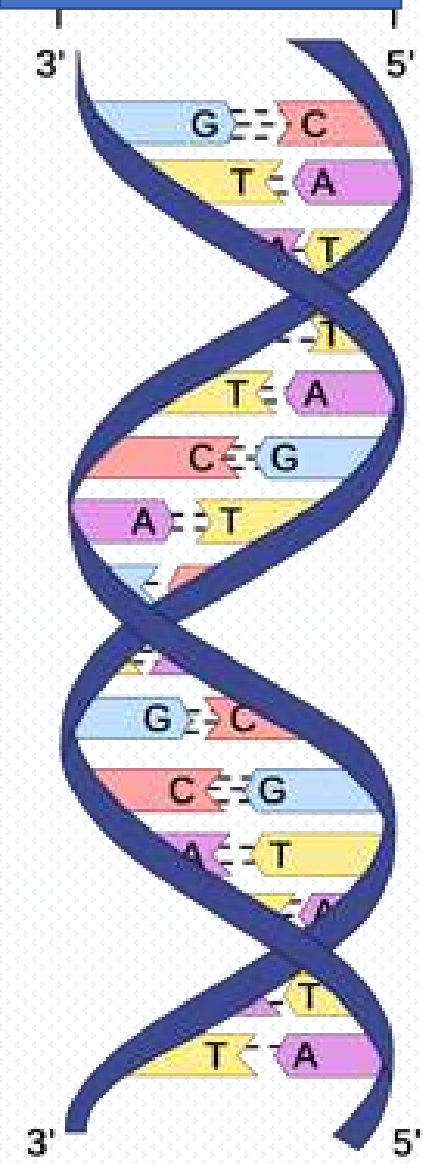
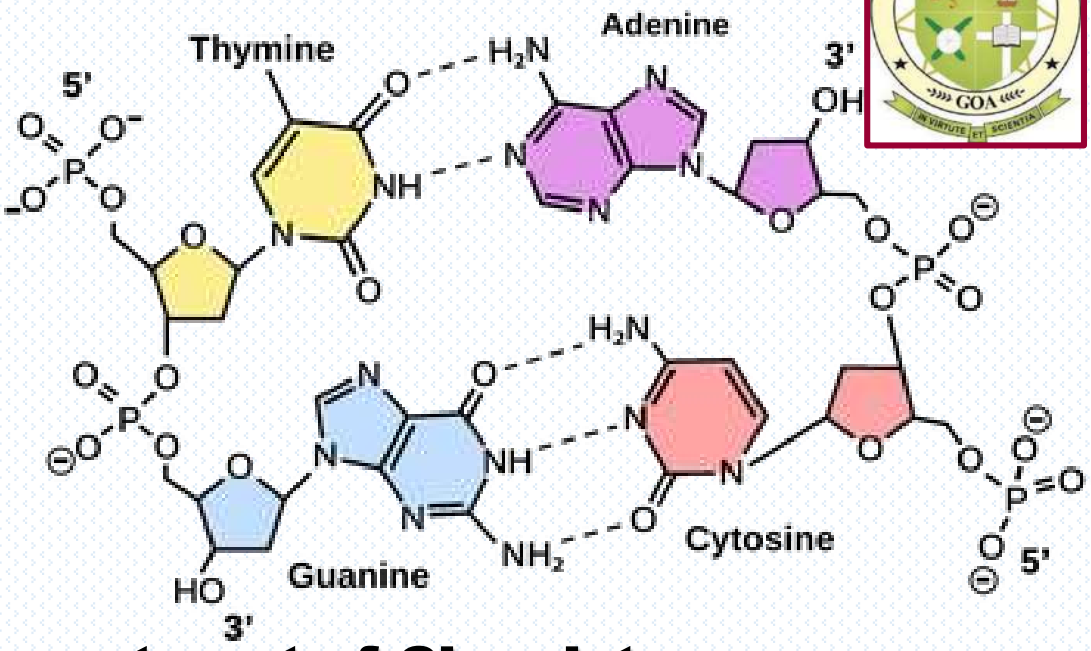



# St. Xavier's College

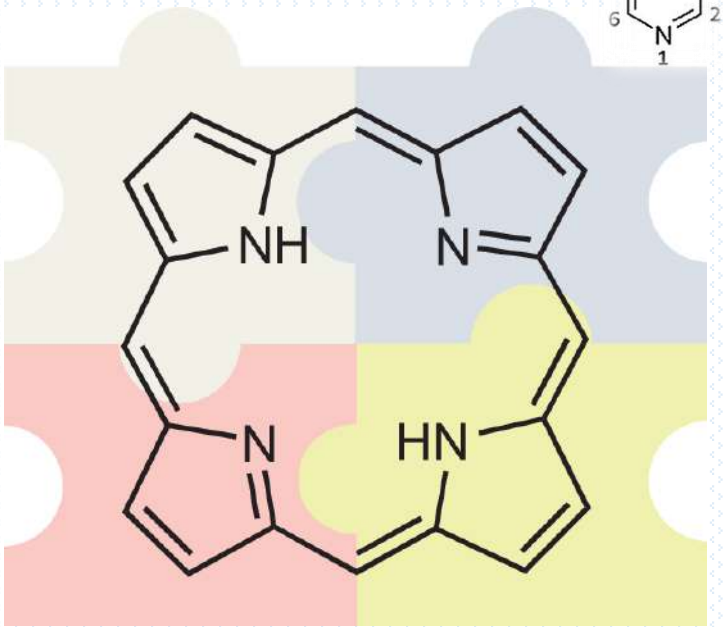
## Mapusa – Goa




## Department of Chemistry

# CATALYST

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




**VOLUME: XV**

**2025 – 2026**

# St. Xavier's College
# CATALYST

**Volume XV** **2025 – 2026**

# Rev. Dr. Nicolau Pereira

***Fondly remembered by Department of Chemistry on the occasion of his birth centenary***

# A Long Way to Go

## *Revisiting Rev. Dr. Antonio Nicolau Pereira's Vision for Indian Education*

**Edwina R. Pereira - Faculty, Department of Chemistry**

Rev. Dr. Antonio Nicolau Pereira, fondly known as POP, served as Principal of St. Xavier's College, Mapusa, and Head of the Department of Chemistry from 1965 to 1991. I had the privilege of being taught Physical Chemistry by this visionary educationist, whose presence inspired admiration, respect, and deep affection. Despite his towering intellect and immense responsibilities, he possessed a rare and beautiful gift: he knew his students by name, making each one of us feel recognised and valued.

I fondly recall a remark of his that resonates as deeply today as it did then:

> *"Higher learning in India has still a long way to go. It is true that India has a hundred and odd universities and over three thousand colleges. However, it is yet to find out whether the returns are proportional to the amount of energy and money spent — or, in other words, whether the human potential of India is being properly converted into the bright reality of a modern cultured man, each one according to his own abilities."*

The metaphor is industrial, almost thermodynamic. Returns proportional to energy; money and human potential converted into reality. As a chemist, my teacher treated education as a

transformation process — with inputs (money, effort, infrastructure: the hundred universities, the three thousand colleges) and outputs (the "cultured man").

His anxiety was not that India lacked scale; he readily conceded that the scale was impressive. His anxiety was about *yield*. A system can be vast and still be inefficient, expanding its capacity without ever examining whether that capacity truly transforms anyone. This is a critique of quantity mistaken for achievement — a very different concern from the care of the whole person.

There is also a quiet humility in his phrasing that is easy to miss. He does not declare the system a failure; he says only that it is "yet to find out." Part of the problem, he suggests, is that India has not yet built the instruments to measure its own return — a system running at full scale without any means of knowing whether it is working.

And the phrase "each one according to his own abilities" does real work. One can process thousands of students identically and call it productivity, but if that flattens individual ability, the conversion has failed on its own terms.

His lessons extended far beyond Physical Chemistry — they were lessons in curiosity, integrity, and dedication. Rev. Dr. Antonio Nicolau Pereira's legacy lives on in the countless lives he shaped, in the values he instilled, and in the enduring spirit of St. Xavier's College.

***

# Department of CHEMISTRY

KNOWLEDGE • DISCOVERY • RESPONSIBILITY

*Learning Today, Creating a Better Tomorrow*

## 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.


INQUIRE | DISCOVER | INNOVATE | INSPIRE | IMPACT SOCIETY

*Chemistry shapes our world. Together, we create a better tomorrow.*

## 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.**

# Administrator's Message

*"Education is not the filling of a pail, but the lighting of a fire."* This oft-quoted insight, attributed to the renowned Irish poet and playwright William Butler Yeats, aptly captures the true purpose of education. Inspired by this vision of igniting minds and nurturing human potential, the Church in Goa embraced the mission of education with remarkable zeal and commitment.

Soon after the liberation of Goa, the Church established St. Xavier's College, Mapusa under the pioneering leadership of Fr. Edwin D'Cruz, SJ, its founding Principal. The College began its journey in a building belonging to the MSFS Fathers at Bastora and functioned there until 1969, when it was shifted to Mapusa, where it continues to flourish today.

A decisive chapter in the institution's history began when its stewardship was entrusted to Dr. Nicolau Pereira, a visionary educationist and an eminent academic. Building upon the strong foundation laid by Fr. Edwin D'Cruz, he transformed the College into one of Goa's premier centres of higher learning. His legacy of excellence, innovation, and service continues to inspire the institution to this day.

Over the years, the landscape of education has undergone profound changes. Yet, St. Xavier's College has remained

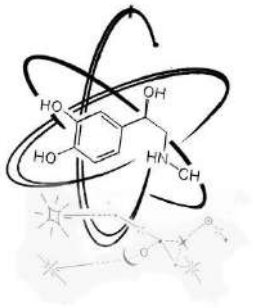
steadfast in its commitment to academic excellence, thanks to the dedication of its teaching and non-teaching staff, the perseverance of its students, and the enduring vision of Dr. Nicolau Pereira. Their collective efforts have enabled the College to uphold its cherished values while responding creatively to the challenges of a changing world.

As we place this departmental magazine in the hands of our staff and students, we express our gratitude to all those who have contributed to the growth and reputation of the College. May the spirit of dedication, excellence, and service that has shaped our journey continue to guide us towards greater heights. A perusal of the contents of this magazine leads us to appreciate the work that is going on in the Department of Chemistry and which will definitely serve as a valuable guide, helping to strengthen our shared commitment to learning, integrity, and the holistic development of every student.

I would like to congratulate the Editorial Board for releasing this magazine at the start of the new academic year. This will help the freshers to understand the academic excellence that is demanded of them, while tickling the enthusiasm of the seniors to set a benchmark for themselves.

May God bless all!

**Fr. Tony Salema**
**Administrator**



# Principal's Message

It gives me great pleasure to pen a message for "Catalyst" a name that truly reflects the role the Department of Chemistry plays in science education in our college.

In a world facing challenges of environment, health, energy and materials, chemical science has an important role to play. The department of chemistry with its well-equipped laboratories and skilled faculty ensure quality education to our budding chemists.

The keen interest in research undertaken by the faculty and the constant motivation provided to students is commendable.

This year we celebrate the birth centenary of an exemplary teacher of chemistry, a renowned scholar, pioneer of the Department, Principal of this college for more than two decades, Late Rev. Dr. Nicolau Pereira. The department has the proud privilege of owning his legacy. May his teachings continue to inspire and guide all.

On the release of this newsletter, my Hearty Congratulations to the Editor Dr Johnross Albuquerque, the entire editorial team, the HoD and all the faculty members and students of the department. May Catalyst continue to document and inspire the spirit of curiosity and academic excellence.

Best wishes for a successful year ahead.

**Ursula Barreto**

# Message from Head of Department

**Chemistry, often known as the *central science*, plays a vital role in understanding the world around us and in addressing the challenges of modern society. From healthcare and environmental conservation to technological advancements and sustainable development, chemistry continues to shape our lives in countless ways. As educators, our goal is not only to impart scientific knowledge but also to inspire curiosity, critical thinking, and innovation among our students.**

**The academic year 2025–2026 has been marked by several enriching academic, co-curricular, and outreach activities that have contributed to the growth and development of our students. Through value-added courses, guest lectures, quizzes, field and industrial visits, research-oriented programmes, and training sessions such as the GU-ART preparation programme, we have strived to provide opportunities that extend learning beyond the classroom.**

**This year also witnessed active participation by our faculty and students in research, innovation, conferences, outreach programmes, and intercollegiate competitions. We take pride in the achievements of our students, who have excelled in quizzes, presentations, and various scientific events, as well as our faculty members, who have contributed significantly through research publications, conference presentations, awards, and funded projects.**

**It gives me immense pleasure to present *Volume* XV of "CATALYST", which highlights the activities, accomplishments, and memorable milestones of the Department of Chemistry during the academic year 2025–2026. This newsletter is a reflection of the dedication and collective efforts of our faculty, students, laboratory staff, and well-wishers.**

**I sincerely thank everyone who contributed to this edition and to the success of the department throughout the year. On behalf of the Department of Chemistry, I wish our students every success in their future endeavors and encourage them to continue pursuing knowledge with enthusiasm, integrity, and a spirit of inquiry.**

**Ms. Janesline Fernandes**
***Head, Department of Chemistry (from December 2025 onwards)***
***St. Xavier's College, Mapusa-Goa.***

# Message from Former Head of Department

**It gives me immense pleasure to present** Volume XV of ***Catalyst*****, the annual newsletter of the Department of Chemistry, St. Xavier's College, Mapusa–Goa. This edition reflects another enriching academic year marked by learning, innovation, research, and meaningful engagement in the ever-evolving world of chemistry.**

**Our vision of using the knowledge of chemistry for the benefit of society and the conservation of the environment continues to inspire all our academic and co-curricular endeavours. During the academic year 2025–26, the department organized a wide range of activities aimed at nurturing scientific temper, developing practical skills, and exposing students to emerging areas of chemical sciences. The introduction of the Value-Addition Course in Quantum Chemistry and Computational Chemistry, educational visits to the National Centre for Polar and Ocean Research (NCPOR) and Kaiga Generating Station, the GU-ART preparation programme, and various lectures, quizzes, and awareness programmes enriched the learning experiences of our students.**

**The department also successfully conducted flagship events such as the** 10th Annual Festival of Innovation: Goa's Young Innovators, Chemscope 2026, **and the** National Science Day **celebrations, which provided students with platforms to explore creativity, innovation, and scientific inquiry. Our outreach activities under** Vidnyan Dhara 2026 **further strengthened our commitment to promoting scientific awareness among school students and the wider community.**

**I am proud of the accomplishments of our faculty members who actively participated in conferences, workshops, faculty development programmes, research activities, and publications. Special congratulations are due to Ms. Janesline Fernandes and Ms. Shivta Mayenkar for receiving awards at ICNMGT 2025, Dr. Rheane Da Silva for securing research grants, and Ms. Kathleen Pinto for her research publication. These achievements reflect the department's growing research culture and commitment to academic excellence.**

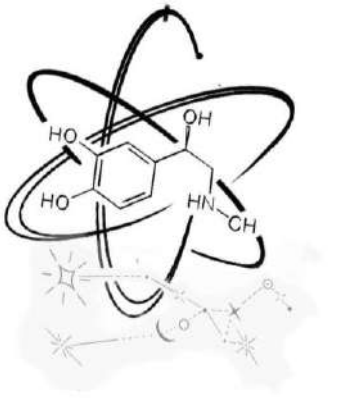
Our students have continued to bring laurels to the department through their outstanding performances in intercollegiate quizzes (Green Chemistry Quiz, etc.), scientific presentations, innovation competitions, and cultural-scientific events (Swach BYharat cleaning in the lab). Their enthusiasm, dedication, and achievements make us proud and motivate us to strive for even greater excellence.

I extend my heartfelt gratitude to all the faculty members, laboratory staff, students, alumni, collaborators, and well-wishers whose support and cooperation contributed to the success of our activities throughout the year. I am especially grateful to Dr. Johnross Albuquerque, technical editor of *Catalyst*, for his dedicated efforts in compiling and documenting the department's achievements in this edition and for editing Catalyst for the last 5 years with d`edication, passion and keen interest.

I also express my sincere appreciation to our Principal, Administrator, and Management for their constant encouragement and support. Above all, I thank God for His blessings and guidance during a fruitful and rewarding academic year.

May *Catalyst* continue to inspire our students to explore, innovate, and contribute meaningfully to science and society.

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



# Congratulations

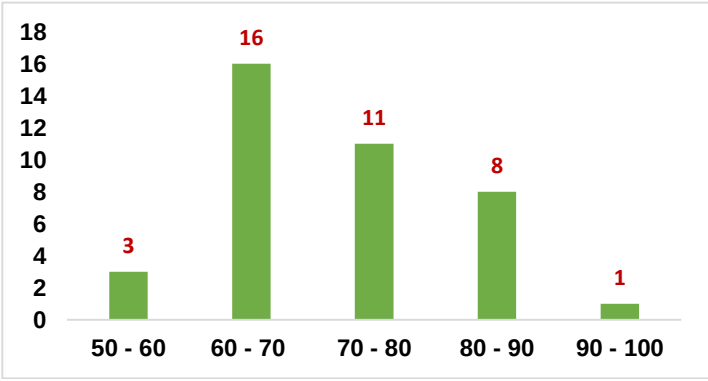

Our faculty

## Ms. Janesline Fernandes

was felicitated by the
Archdiocesan Board of Education,
for **30 years** of meritorious services
in the field of education,
on 13th February 2025
at Ravindra Bhavan, Margao.

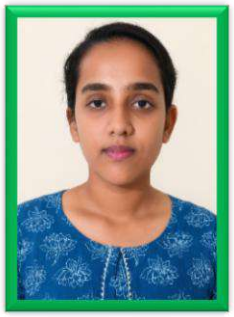
*We wish her well*
*in the years to come.*

# T.Y. CHEMISTRY EXAMINATION RESULTS 2025 – 2026




Overall performance (in terms of %)

## FIRST TEN TOPPERS

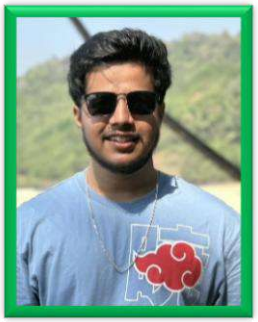


**Ms. Gavravi Uday Chari**
**90.50 %**

**Ms. Krusiya Sawant**
**86.80 %**

**Ms. Utkarsha Kotkar**
**85.60 %**

**Ms. Michele Barreto**
**83.20 %**



**Mr. Suyash Shetgaonkar**
**82.90 %**

**Ms. Aurooj Zahoor Bhat**
**82.30 %**

**Ms. Suyesha Naik**
**82.30 %**

**Ms. Riya Satish Naik**
**82.10 %**

**Ms. Nevita Gaonkar**
**81.50 %**

**Ms. Tanvi Shirodkar**
**79.00 %**

**Ms. Vinisha Bablo Korgaonkar**
**79.00 %**

*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.

# Our Top Ten

## GUART Rankers

| Rank | Name of student | |
|---|---|---|
| 07 | Ms. Utkarsha Kotkar |  |
| 37 | Ms. Aurooj Zahoor Bhat |  |
| 48 | Mr. Aniket Parsekar |  |
| 56 | Mr. Soham Kauthankar |  |
| 62 | Ms. Vinisha Bablo Korgaonkar |  |
| 70 | Ms. Krusiya Sawant |  |

Continued...

**Continued…**

| Rank | Name of student | |
|---|---|---|
| 73 | Mr. Tejas Kundaikar |  |
| 74 | Ms. Vidhi Gawde |  |
| 100 | Mr. Prayag Pednekar |  |
| 107 | Ms. Shruti Salgaonkar |  |


**YOU'LL ARE OUTSTANDING EXAMPLES OF HARDWORK, PERSEVERENCE AND COMMITMENT TO YOUR STUDIES.**

# INDEX

## 2025



## 2026


Departmental
Activities
2025 – 2026

## Orientation session on Library Resources & Facilities

A special orientation session on library resources and facilities was organized by the Department of Chemistry, St. Xavier's College, Mapusa, for the T.Y.B.Sc. Chemistry students. The session was conducted by Librarian Ms. Dakshata Zambulkar with the aim of familiarizing students with the various library services and promoting the effective use of resources for academic and research purposes.

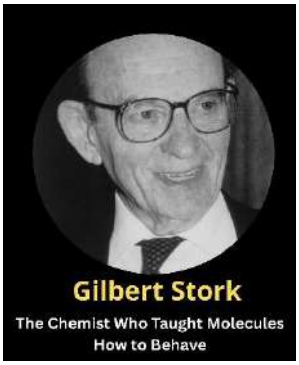

Ms. Zambulkar explained the use of reference materials, e-resources, online journals, and databases, and provided hands-on training on accessing and using these tools efficiently. Students were also guided on searching for books using the library catalogue and making effective use of study areas and digital facilities. The session was highly informative and encouraged students to develop research-oriented learning habits. It helped them recognize the importance of the library as a center for academic excellence. The event was coordinated by Ms. Kathleen Pinto, Head of the Chemistry Department.

**THE CHANGE OF STATE A change of state is a physical process where matter transitions between its solid, liquid, or gaseous forms due to a gain or loss of energy, typically from heating or cooling.**

**Born**: 31st December 1921 (Brussels, Belgium)

**Contribution to Chemistry**:

- Pioneer of modern Synthetic Organic Chemistry and developed the Stork Enamine reaction, a key method for forming carbon–carbon bonds
- Introduced innovative strategies for controlling stereochemistry in complex molecule synthesis; first to accomplish the total synthesis of morphine (1952).
- Long-time professor at Columbia University who trained generations of leading chemists.




**Professor Gilbert Stork is widely respected for shaping the strategy-driven approach used in organic synthesis today.**

## General Awareness on Illegal Use of Narcotic Drugs

A session on 'General Awareness on Illegal Use of Narcotic Drugs' was organized by the UG & PG Departments of Chemistry, St. Xavier's College in the PG Conference Hall from 10:45 to 11:45 a.m. The resource person was Ms. Meghna M. Jadhav, Clinical Psychologist at Tele Manas Cell, South Goa District Hospital.


The session aimed to raise awareness about drug abuse, its consequences, and government initiatives for prevention and rehabilitation. Ms. Sheryl D'Cruz welcomed and introduced the speaker, while Prof. Afonso Botelho presented a token of appreciation. Ms. Jadhav explained types of drugs, including opioids, stimulants, and depressants, and discussed addiction, precursors, and synthetic chemicals. She also demonstrated the Tele Manas helpline and engaged students

with a quiz. The session was coordinated by Ms. Kathleen Pinto (HOD, UG Chemistry) and Ms. Rupali Neji (PG Course Coordinator).

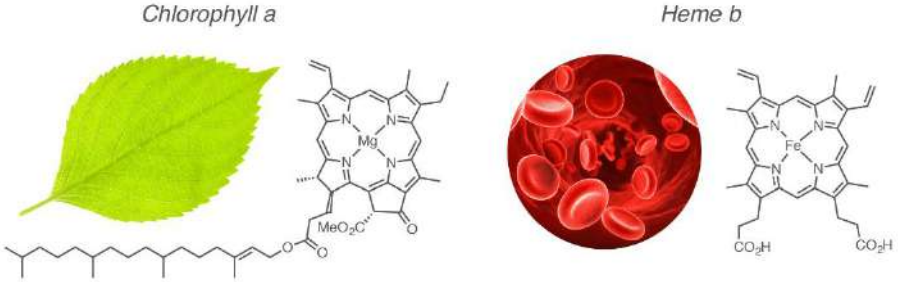
## Value-Addition course in Introduction to Quantum Chemistry and Computational Chemistry

The Department of Chemistry floated a Value-addition course on Introduction to Quantum Chemistry and Computational Chemistry in associating with the Internal Quality Assurance Cell (IQAC) of the college. Dr. Johnross Albuquerque, Assistant Professor from the Department conducted the sessions under the guidance of Ms. Kathleen Pinto, Head of Department. About 15 students registered for the course. In the odd semester, 3 sessions were held: 9th September 2025, 23rd September 2025 and 30th September 2025 while in the even semester another set of 3 sessions took place 26th February 2026 and 5th March 2026.

In all these sessions, basic concepts like the Schrodinger Equation, operators etc. were covered and students were introduced to Gaussview software for visualizing molecules. They were also taught on performing QM calculations and interpreting the results.

# Annual Third-Year Chemistry Students' Quiz

The Annual Third-Year Chemistry Students' Quiz was held as an intra-class event in Room 210, the T.Y.B.Sc. Chemistry classroom. The quiz aimed to enhance students' aptitude and reinforce core chemistry concepts. The event was coordinated by Dr. Mira Parmekar under the guidance of Ms. Kathleen Pinto, Head of the Department. A total of 35 students participated in the written preliminary round, with the top 10 students qualifying for the oral quiz. Ms. Utkarsha Kotkar and Ms. Vinisha Korgaonkar secured First Place, followed by Ms. Aurooj Bhat and Ms. Shruti Salgaonkar in Second Place, and Ms. Michele Barreto and Mr. Aniket Parsekar in Third Place. Additional finalists included Mr. Tejas Kundaikar and Ms. Apoorva Mahadeshwar, and Mr. Soham Kauthankar and Mr. Sudhanshu Halarnkar. Ms. Pradnya Shetye served as the scorekeeper, while Ms. Tanvi Shirodkar was the timekeeper. Dr. Mira Parmekar was the coordinator of the quiz.



# Research in Chemistry

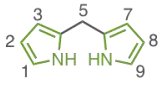
SEPTEMBER 27

A talk on “Research in Chemistry” was organized at 12:45 p.m. in Room 210 for the T.Y.B.Sc. Chemistry students. The session aimed to create awareness about research-based learning and the diverse opportunities in chemical research. The Resource Persons were Ms. Shivta Mhamal and Ms. Flavia Travasso, Research Scholars and Assistant Professors at St. Xavier’s College. The programme was coordinated by Ms. Kathleen Pinto, Head of the Chemistry Department, and compered by Mr. Clarence Rodrigues. Around 40 students attended the session.

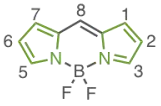

Ms. Flavia discussed emerging areas such as organic synthesis, green chemistry, nanomaterials, and catalysis, stressing the importance of sustainability in research. Ms. Shivta guided students on preparing and publishing research papers, illustrating key sections through a sample article. The session was highly informative and encouraged students to pursue innovative, eco-friendly research for societal advancement.

# Chemistry Department Cleanliness Drive under Swachh Bharat Mission

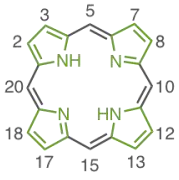
The Department of Chemistry, St. Xavier's College, Mapusa, organized a Cleanliness Drive at 12:45 p.m. as part of the Swachh Bharat Mission. The initiative aimed to promote hygiene, safety, and environmental responsibility within the Chemistry Laboratories. Faculty members along with the T.Y.B.Sc. Chemistry students actively participated in the drive, cleaning lab benches, glassware, and storage areas, and ensuring proper organization of laboratory equipment. Emphasis was placed on waste segregation, safe disposal of materials, and maintaining cleanliness standards essential for a safe working environment. The activity fostered teamwork and a sense of shared responsibility among the students and staff. It also encouraged awareness about the importance of cleanliness in scientific practice and sustainable lab management. Through this initiative, the department reaffirmed its commitment to the Swachh Bharat Mission and to creating a clean, safe, and inspiring space for learning and research.



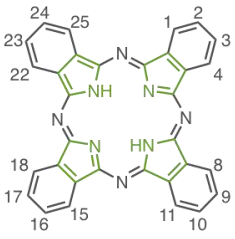
*Dipyrrylmethane*



*BODIPY*



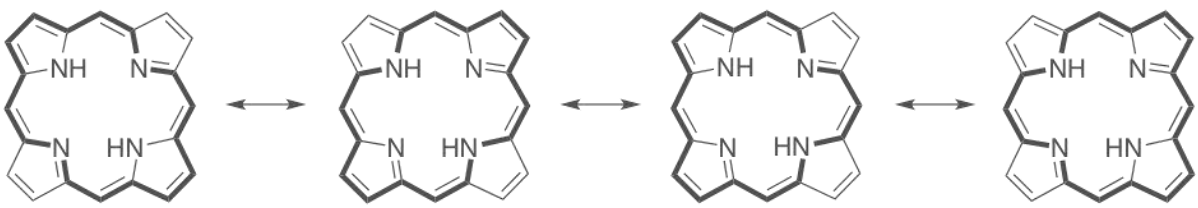
*Porphyrin*



*Phthalocyanine*

## Field Visit to the National Centre for Polar and Ocean Research (NCPOR), Vasco-da-Gama


The Department of Chemistry, St. Xavier's College, Mapusa, organized a field trip to the National Centre for Polar and Ocean Research (NCPOR), Vasco-da-Gama, for T.Y.B.Sc. Chemistry students. A group of 39 students, accompanied by four faculty members, had the unique opportunity to interact with scientists at India's premier institute for Polar and Ocean research. Dr. Archana Singh, Scientist D, briefed the group on NCPOR's key mandates, including the Indian Antarctic and Arctic Programs and Southern Ocean studies, highlighting their contribution to national policy formulation. Students were taken on a guided tour of advanced laboratories such as the SEM-EDS, Polar Biology, Geology, and Cryobiology Labs, gaining insights into sophisticated research techniques. The enriching visit, coordinated by Mr. Mahesh Nair under the mentorship of Ms. Kathleen Pinto, inspired many students to pursue future research opportunities at NCPOR.

Electron delocalization pathway of porphyrins.

# GU-ART Preparation Training Program

The Department of Chemistry at St. Xavier's College, Mapusa, successfully conducted a comprehensive training program tailored for Third Year B.Sc. Chemistry students to prepare them for the Goa University Admission Ranking Test (GU-ART). Recognizing the competitive nature of postgraduate admissions, this initiative was specifically designed to equip graduating students with the analytical skills and specialized knowledge required to excel in the entrance examination and secure placements in reputed higher education institutes across Goa.


The program was executed over two intensive Saturday sessions, held on **3rd January 2026** and **17th January 2026**. These sessions took place in Room No. 210, beginning at 12:00 p.m. and continuing through the afternoon to allow for in-depth discussion and problem-solving. Each session featured a subject-matter expert who provided targeted guidance.

The first session was led by Ms. Dalcy Fernandes, who laid the foundation for the training, while the second session was facilitated by Ms. Simran Shaikh, who served as the resource person for the concluding modules. The curriculum of the

training program was strategically structured to cover the core pillars of the chemical sciences, namely Organic, Inorganic, and Physical Chemistry. Moving beyond standard classroom lectures, the resource persons employed a pedagogical blend of intensive concept reviews and the application of those concepts to complex practice questions. A significant portion of the training was dedicated to "entrance-style" strategy, including tips on time management, navigating multiple-choice pitfalls, and refining the logical approach required for competitive ranking tests.

The coordination of this successful academic initiative was overseen by Ms. Sheryl D'Cruz and Dr. Johnross Albuquerque. The Department remains committed to fostering such student-centric programs that pave the way for the academic and professional advancement of its scholars.

## 10th Annual Festival of Innovation: Goa's Young Innovators

The Department of Chemistry at St. Xavier's College, Mapusa, in association with the Institution's Innovation Cell, hosted the landmark 10th edition of the "Festival of Innovation: Goa's Young Innovators." The event drew an impressive assembly of young minds, with participants representing 26 academic institutions from across the state of Goa.


The inaugural ceremony commenced with a solemn invocation and a symbolic watering of the plant, signifying the growth and nurturing of new ideas. Prof. Afonso Botelho, Professor-in-Charge, formally addressed the gathering, setting an encouraging tone for the day's proceedings. The event was further graced by the presence of Prof. Oscar de Mello, the IIC Coordinator, who highlighted the institution's commitment to fostering an entrepreneurial spirit. The Chief Guest for the occasion, Dr. Mahesh Majik, Professor at the Centre for Research Development

& Innovation, SHEC, Directorate of Higher Education, delivered a thought-provoking keynote address. Dr. Majik elucidated the nuanced distinction between research and innovation, drawing on diverse examples to demonstrate how simple, observant shifts in thinking have historically led to remarkable utility innovations for humanity. He urged the students to cultivate the habits of keen observation, persistent questioning, and rigorous analysis, motivating them to pursue innovation in even the smallest facets of daily life.

The festival featured two primary competitive tracks designed to challenge both the creative and scientific temperaments of the students. The first was a one-minute video-making competition centered on the 15th Sustainable Development Goal (SDG): Life on Land. The second was the flagship "Scientific Model Making" competition, where students showcased tangible solutions to contemporary problems.



Following a rigorous evaluation of the entries across School, Higher Secondary (HSS), and College categories, the prize winners were announced.

- In the School category, St. Joseph's High School, Calangute, and The Rosary High School, Cujira, secured top honors in their respective competitions.
- The HSS category saw a strong performance from Purushottam Walawalkar and a shared first place in the model-making competition between St. Xavier's HSS, Mapusa, and Shri Bhumika HSS.
- At the College level, Ganpat Parsekar College of Education and Dnyanprassarak Mandal's College and Research Centre, Assagao, claimed the first-place positions.

The event concluded with a formal valedictory function and a celebratory prize distribution ceremony. Ms. Sheryl D'Cruz, the event coordinator, proposed the vote of thanks, expressing gratitude to the guests, participating institutions, and the organizing committee for making the decennial celebration of innovation a resounding success.

## Educational Visit to Kaiga Generating Station


The Department of Chemistry at St. Xavier's College, Mapusa, organized an industrial visit to the Kaiga Generating Station (KGS) in Karnataka. This experiential learning initiative was designed to bridge the gap between theoretical nuclear chemistry and physics with practical, large-scale industrial applications. A delegation of 33 undergraduate students from the Chemistry and Physics streams, accompanied by four faculty members—Prof. Nelson Lobo, Dr. Manoj Salgaonkar, Mr. Mahesh Nair, and Ms. Sheryl D'Cruz—participated in this technical tour.

Upon arrival, the group was introduced to the site's infrastructure via a detailed layout model of the plant. The briefing highlighted that the facility currently operates four nuclear reactors, with an additional two units under construction to enhance the nation's power grid.


The technical core of the visit commenced in the auditorium, where Mr. Satish, a station engineer, delivered an extensive technical presentation. He detailed the fundamental principles of nuclear fission, the mechanics of energy harvesting within a Pressurized Heavy Water Reactor (PHWR), and the rigorous safety protocols mandated by the Nuclear Power Corporation of India Limited (NPCIL). A significant portion of the session was dedicated to debunking common misconceptions regarding nuclear radiation, with Mr. Satish presenting data to support nuclear power as a safe, sustainable, and "green" energy source. He further elaborated on the reactor's current output and its strategic role in supplying electricity to neighboring regions. The students then observed a fully automated demonstration model, which provided a step-by-step visualization of the reactor's internal processes. This was followed by a visit to the Simulator Room, a high-tech facility

where the technicalities of reactor control and emergency response systems were explained. This session offered students a rare glimpse into the complex instrumentation and monitoring required to maintain nuclear stability.

In addition to the scientific exposure, the visit served as a career guidance platform. The engineers outlined the various professional pathways and recruitment requirements for students wishing to pursue employment within the nuclear energy sector. The visit concluded with a highly interactive Q&A session, leaving the students with a profound understanding of how advanced chemical and physical theories are harnessed to meet the country's growing energy demands.

## National Science Day

The Department of Chemistry at St. Xavier's College, Mapusa, commemorated National Science Day with a high-impact guest lecture program held in Room No. 210. The event was specifically curated for First Year (FY) and Second Year (SY) Science students to foster scientific inquiry and provide a clear roadmap from academic theory to professional industrial practice.

The program commenced with an address by Ms. Janesline Fernandes, Head of the Department of Chemistry, who underscored the vital importance of academic-industry partnerships in shaping the next generation of scientists. The seminar featured two distinguished industry leaders from Glenmark Pharmaceuticals,

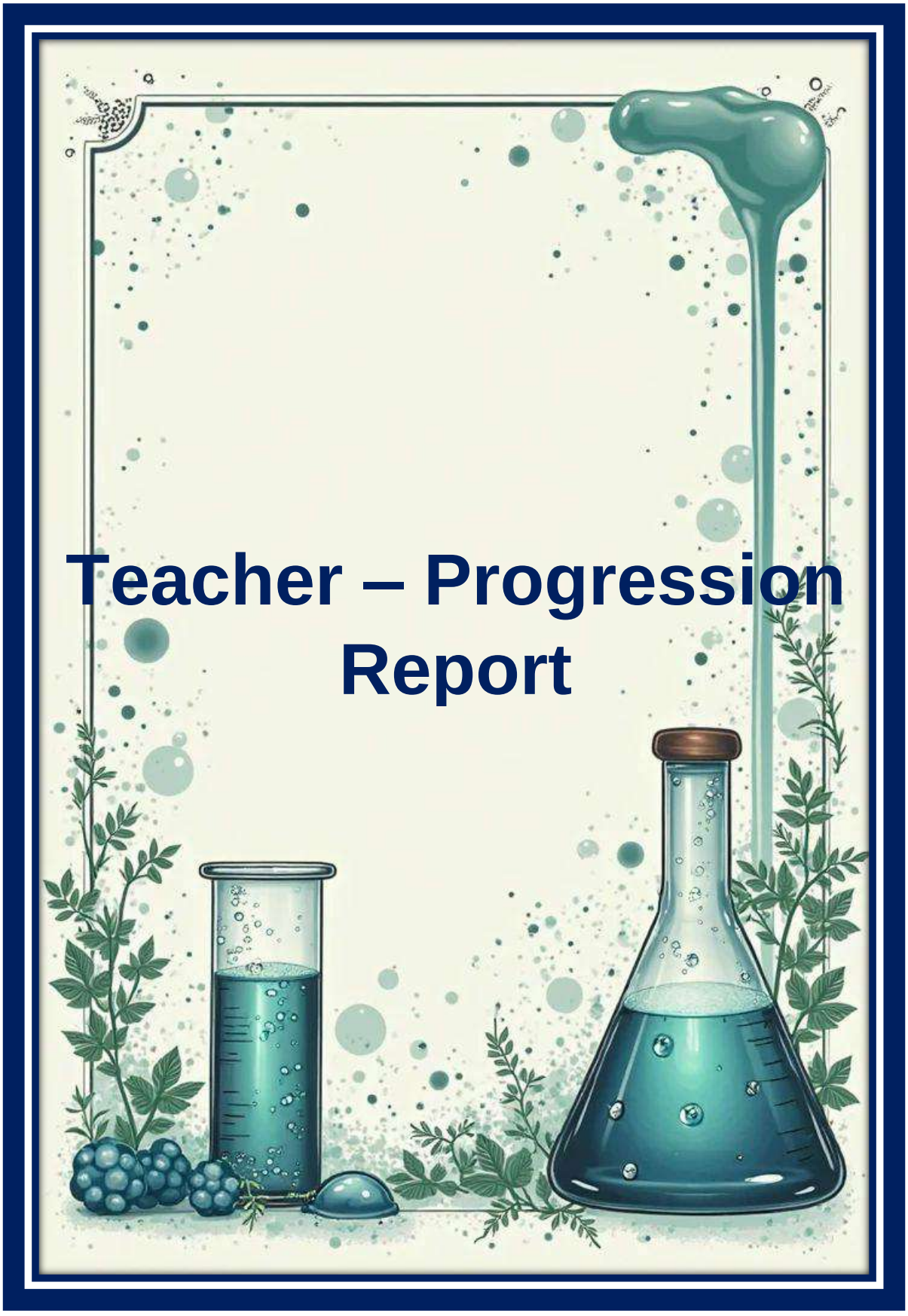
providing students with both practical and futuristic perspectives on the chemical sciences. Delivered by Mr. Veerdhaval Kamble (Deputy General Manager – Quality Assurance), this session offered a panoramic view of the transition from undergraduate chemistry to the professional pharmaceutical sector. Mr. Kamble highlighted how foundational classroom concepts translate into the rigorous demands of a world-class manufacturing environment. He stressed that a successful career in the industry is built upon a strong scientific temperament, meticulous attention to detail, and a commitment to continuous learning Mr. Nilesh Kurdikar (Deputy General Manager – Quality Assurance) presented a forward-looking discourse on the digital transformation of medicine. He detailed how Artificial Intelligence (AI) and machine learning are revolutionizing drug discovery. By predicting molecular interactions and screening vast chemical libraries, AI is significantly reducing the time and capital required to bring life-saving medicines to the market.

The lectures were followed by an engaging Q&A session, where students actively inquired about the evolving landscape of AI-driven roles and the specific skill sets required for the future pharmaceutical workforce. The event concluded with a formal vote of thanks delivered by Dr. Johnross Albuquerque, expressing appreciation to the speakers for their invaluable insights. The successful execution of the National Science Day program was coordinated by Mr. Clarence Rodrigues, further strengthening the department's commitment to excellence in science education.

# CHEMSCOPE 2026

The Under Graduate and Post Graduate and Department of Chemistry at St. Xavier's College organized Chemscope 2026, a state-level intercollegiate event, bringing together students from various colleges across Goa. The event provided a vibrant platform for chemistry students to showcase their talent coordinated by Dr. Rheane Da Silva and co-cordinated by Dr. Mamta Prabhhugaonkar through 7 engaging sub-events: Chemtok, Chem Comedy, Chem dance, Feel it reel it, Flask of Fantansy, Lab Experiment and Chem musketeers. Students from three colleges across Goa – Government College (Sanqulem), Chowgule College (Margao) and Carmel Women's College (Nuvem) participated in the event.


Professor Rajendra Shirsat, from School of Chemical Sciences, Goa University, graced the occasion as the Chief Guest. In his address to the gathering, Professor Shirsat encouraged students to perform experiments and understand the science behind each and every step. Government College, Sanquelim emerged as the overall champions, while Carmel College, Nuvem secured the runners-up position. The success of the event was made possible through the guidance of the department faculty and the enthusiastic participation of students, making Chemscope 2026 a memorable and enriching experience.


Teacher – Progression Report

# PROGRAMMES ATTENDED (WORKSHOPS / CONFERENCES)

## One-Day Workshop on 'NEP-Aligned Inorganic Curriculum: Revisiting Structure, Content & Pedagogy'


Faculty members Ms. Edwina Pereira and Ms. Janesline Fernandes from the Department of Chemistry participated in a one-day workshop on "NEP-Aligned Inorganic Curriculum: Revisiting Structure, Content & Pedagogy" organized by the Department of Chemistry, Government College, Khandola, Goa. The workshop aimed to align the Inorganic Chemistry curriculum with NEP-2020 by reviewing its structure, content, and pedagogy. Prof. Vidyadatta Verenkar delivered the keynote address, emphasizing flexibility, interdisciplinarity, and skill-based learning. Sessions focused on theoretical topics, modern laboratory practices, and innovative teaching–learning and assessment methods. An open discussion enabled participants to share feedback and suggestions. The workshop provided valuable insights for updating and strengthening the Inorganic Chemistry curriculum in accordance with NEP-2020 guidelines.

## Three-Day Workshop on Intellectual Property Rights (IPR)

Dr. Mira Parmekar and Dr. Johnross Albuquerque from the Department of Chemistry participated in a Three-Day Workshop on Intellectual Property Rights (IPR) held from **16th** to **18th September 2025**. The workshop began with an inaugural session graced by Mr. Bhushan K. Savaikar, Director of Higher Education, Government of Goa, as the Chief Guest.

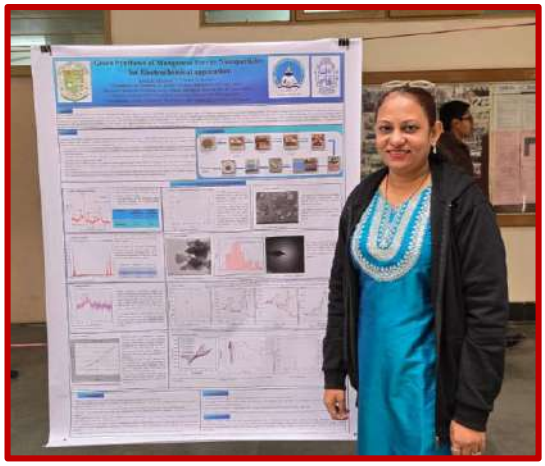
Dr. Yoganjaneyulu Kasetti introduced participants to key concepts of IPR, including Trademark, Copyright, Geographical Indications (GI), Industrial Design, and Trade Secrets. Ms. Sneha Menon conducted a detailed session on patent drafting and specification writing, highlighting Section 10(4) of the Indian Patent Act, followed by discussions on claims and filing procedures. The final day focused on Geographical

Indications and their role in protecting traditional innovations. The workshop concluded with certificate distribution and provided participants with valuable practical knowledge of patent filing and intellectual property protection.


## Participation in ICNMGT 2025

Faculty members: Prof. Tushar S. Anvekar, Ms. Janesline Fernandes, Ms. Shivta H. Mayenkar and Ms. Flavia Sheila Travasso participated in the International Conference on Nanomaterials & Green Technology for Viksit Bharat "Mission 2047" (ICNMGT 2025) held at Uttaranchal University, Dehradun from **28th** to **29th November 2025**.

| Name | Category of presentation | Title of Presentation |
|---|---|---|
| Prof. Tushar Anvekar | Poster | Green Synthesis, Characterization and Applications of Cerium and Samarium ion doped ZnO nanoparticles |
| Ms. Janesline Fernandes | Oral paper | Tailoring $CoFe_2O_4$ Nanomaterials for Electrochemical Energy Applications via $Dy^{3+}$ substitution |
| Ms. Shivta. Mayenkar | Poster | Green synthesis of manganese ferrite nanoparticles for electrochemical application |
| Ms. Flavia Travasso | Oral paper | Biosynthesised Copper Ferrite as Magnetically Recoverable Nanocatalyst in Organic Reactions" |




Ms. Janesline Fernandes won the Best Research Paper Presentation Award (Oral Category – 2nd place) and Ms. Shivta Mayenkar received the Best Research Paper Presentation Award (Poster Category – 2nd place) at ICNMGT 2025.


## Two-day workshop on Electron Microscopy and Photoelectron Spectroscopy

Ms. Janesline Fernandes attended a two-day workshop on Electron Microscopy and Photoelectron Spectroscopy organized under DST – PURSE by the School of Physical and Applied Sciences, Goa University, held on **10th – 11th December 2025**.

## One-week Entrepreneurship Training Programme at EDII, Ahmedabad, Gujarat

Two faculty members: Dr. Johnross Albuquerque (from Chemistry) and Mr. Carmelito De Souza (from Department of Commerce) were deputed to the Entrepreneurship Development Institute of India (EDII), Ahmedabad, Gujarat, for a week-long training programme held from **4th – 11th January 2026**.


## 5-Day AI Faculty Development Programme at DHE

Faculty members: Mr. Clarence Rodrigues and Dr. Johnross Albuquerque were deputed to attend a 5-day FDP on 'Artificial Intelligence (AI) Tools for Pedagogical Enhancement in Higher Education', organized by DHE, Government of Goa in collaboration with IITDM, Jabalpur from **12th January** to **16th January 2026**.

The FDP provided hands-on exposure to emerging AI-based teaching and learning tools, focusing on innovative pedagogical strategies, assessment methods, and curriculum delivery in higher education. Participation in the programme enabled the faculty to enhance digital teaching competencies and integrate AI-driven approaches to improve student engagement and learning outcomes.

## Participation in the National Conference on Material Chemistry (FMSD-26)

Ms. Janesline Fernandes and Ms. Kathleen Pinto, Associate Professors from the Department of Chemistry, St. Xavier's College, Goa, along with SYBSc Chemistry students, participated in the National Conference on Material Chemistry: "Functional Materials for Sustainable Development" (FMSD-26) held on **23rd –24th January 2026**. The conference was organized by the Department of Chemistry, Carmel College for Women, Nuvem, and brought together eminent researchers and academicians to deliberate on advancements in sustainable chemical technologies.

The conference commenced with an inaugural session graced by Chief Guest Prof. Jayant Budkuley, followed by a keynote address delivered by Prof. Rodney Fernandes (IIT Bombay). The technical sessions featured expert speakers from institutions such as CSIR-CLRI, BITS Goa, and IIT Goa, who discussed emerging topics including nano-coenzymes and $CO_2$ conversion technologies.

The second day of the conference focused on specialized research areas, with invited lectures by scientists from TIFR Mumbai, BITS Hyderabad, and Goa University. Topics covered included wastewater treatment methods and advanced material synthesis. The conference also hosted competitive oral and poster presentation sessions.

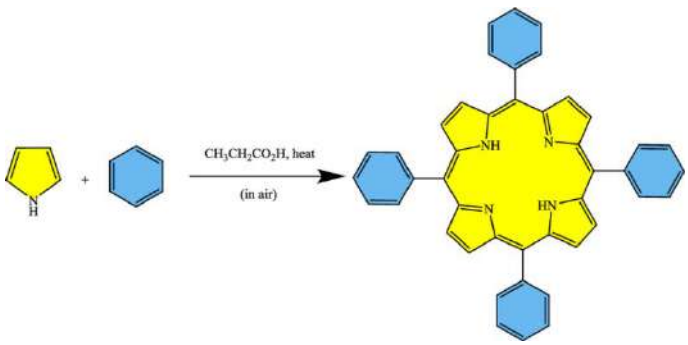
The event concluded with a valedictory function presided over by Chief Guest Prof. Purnakala Samant. Participation in this conference provided valuable exposure to cutting-edge developments in material chemistry, thereby enriching the academic and research experience of both faculty and students, while emphasizing practical solutions for global sustainability.

## Online workshop on 'E-tools for Research: Hands-on Practice'

Ms. Janesline Fernandes attended the one-day online workshop on 'E-tools for Research: Hands-on Practice' organized by the Centre for Research, Alliance University, Bengaluru, on **17th March 2026**.

## International Conference on Advanced Materials for Energy Solutions (ICAMES-26)

Ms. Janesline Fernandes participated in International Conference on Advanced Materials for Energy Solutions (ICAMES-26) held on **09 April 2026** & **10 April 2026** organised by the Department of Physics, Faculty of Arts & Science, Bharath Institute of Higher Education and Research (BIHER), Chennai.



# AWARDS

Ms. Janesline Fernandes won the Best Research Paper Presentation Award (Oral Category – 2nd place) and Ms. Shivta Mayenkar received the Best Research Paper Presentation Award (Poster Category – 2nd place) at **ICNMGT 2025**.

# RESEARCH GRANTS

Dr. Rheane Da Silva got research grants for the following projects (the first one is shared with Dr. Trelita De Souza – faculty of Microbiology department, while the second one is shared with Ms. Sandra Fernandes – faculty of Commerce department)

Sanction order number: GIPARD/ADMN/F/080/2025-26/1079

| Funding Agency | Topic | Period | Funding Amount |
|---|---|---|---|
| GIPARD | Assessment of climate driven shifts in distribution of fish species in Goa's Coastal ecosystem. | November 2024 to March 2025 | Rs. 30,000 /- |
| GIPARD | Assessment of socio-economic & environmental impact of fish waste management. | November 2024 to March 2025 | Rs. 30,000 /- |

# TALKS DELIVERED
# (VIDNYAN DHARA SESSIONS)

In celebration of National Science Day 2026, themed “Women in Science: Catalysing Viksit Bharat,” a series of demonstration-cum-interactive sessions titled “Learning Chemistry the Fun Way” were conducted for high school students as part of the Vidnyan Dhara 2026 Mega-session initiated by the Directorate of Higher Education, Porvorim-Goa.

## Dr. Mira Parmekar

The sessions conducted by Dr. Mira V. Parmekar, engaged students through demonstrations highlighting chemistry in everyday life, making fundamental concepts enjoyable and relatable. Emphasizing experiential learning, the sessions encouraged observation, questioning, and active participation. The outreach programme was conducted at Our Lady of Grace High School (**8th January 2026**), Sacred Heart High School (**21st January 2026**), Shri Mahamaya High School (**11th February 2026**) and Indi-Global Paradise High School (**23rd February 2026)**, fostering scientific curiosity and interest in basic sciences among school students.

**Shri Mahamaya High School, Mayem**


**Indi-Global Paradise High School, Canca-Verla**


**Our Lady of Grace High School, Bicholim**

**Sacred Heart High School, Parra**

## Mr. Clarence Rodrigues

The expert talk on **12th February 2026** at St. Theresa's High School, Candolim, delivered by Mr. Clarence Rodrigues, focused on the theme "Science and Its Impacts on Mankind," highlighting the role of scientific advancements in enhancing quality of life, promoting sustainable development, and nurturing scientific temper among students. The session aimed to inspire young learners to recognize the relevance of science in everyday life and foster interest in scientific learning and innovation.

# PUBLICATION

Ms. Kathleen Pinto published a research article:

**Title:** Development of Biscoumarin Compounds With Quorum-Quenching Potential: Synthetic, Biological, and In Silico Studies

**Authors:** by Kathleen C. Pinto, Linus Coelho, Vinod K. Mandrekar, Hari K. Kadam, Milind Naik and Vishnu R. Chari

**Journal:** Journal of Heterocyclic Chemistry

**Date of publication:** 02 December 2025 (First published date)

**DOI:** https://doi.org/10.1002/jhet.70136


Student Awards
&
Recognitions

# SWACHH BHARAT STUDENT INTERNSHIP (SBSI)

The Chemistry Department of St. Xavier's College, Mapusa–Goa, proudly acknowledges the achievement of the team Ecovengers in the SBSI (Swachh Bharat Summer Internship) 2024–25, study conducted under the Directorate of Unnat Bharat Abhiyan, Goa University. The team secured the **3rd place** in the Village-Level Category, along with a cash award of Rs. 10,000/-, for their impactful work in Korgaon, Pernem. This recognition highlights the team's dedicated efforts towards addressing local challenges and implementing sustainable solutions at the grassroots level. Under the mentorship of Mr. Clarence Rodrigues, the students demonstrated strong scientific application, analysis of pollutants, initiated green initiatives, community engagement, and teamwork.


The members included Mr. Sudhanshu Halarnkar, Ms. Utkarsha Kotkar, Ms. Michele Barreto, Ms. Pradnya Shetye and Ms. Sancia Joanne Pereira.

# AWARDS

## Participation in ATOMICA ’25

The Department of Chemistry, St. Xavier’s College, Mapusa**,** participated in **ATOMICA ’25**, the annual intercollegiate event organized by the Department of Chemistry, Carmel College for Women**,** The programme began with an inaugural ceremony featuring the lighting of the lamp and an address by Principal: Dr. Aldina Braganza, who highlighted the importance of such events in fostering creativity and scientific curiosity among students. Team OSMIUM from St. Xavier’s College delivered an outstanding performance, winning several prizes:


- 1st place in *Time in a Bottle* (Mr. Babaji Gawas & Ms. Rutika Shetmandrekar) and *Micro Mixology* (Mr. Ricardo Menezes & Ms. Rutika Shetmandrekar)
- **2nd place** in *Glam and Green* (Ms. Sarah D’Souza & Ms. Harshita Haldankar) and *Molecules in Motion* (Ms. Samruddhi Borkar et al.).
- St. Xavier’s College was declared **Runners-Up** of the competition.

Dr. Rheane Da Silva was placed in charge of training and preparing the students under the guidance of Ms. Kahtleen Pinto**,** and the students were accompanied by Ms. Sheryl D’Cruz**.**

## Winners of Inter-Collegiate Green Chemistry Quiz

The Department of Chemistry proudly announces that Ms. Utkarsha Kotkar and Ms. Michele Barreto from T.Y.B.Sc. have once again brought laurels to the college by securing the First Place in the Inter-Collegiate Green Chemistry Quiz, organized by DMC College, Assagao, Goa. This marks our fourth consecutive year of victory in this prestigious event — a testament to the consistent excellence, dedication, and teamwork of our students and faculty.

SEPTEMBER 26

A special appreciation goes to Dr. Rheane Da Silva for her valuable mentorship and guidance, particularly in the Lab Safety section, which played a crucial role in the team's success.

## Participation at Inter-Collegiate event: KYNESIS

The Department of Chemistry of Shri Parvatibai Chowgule college, Margao, hosted its Intercollegiate event 'Kynesis'. Our students put up a close fight with the other teams to win the well-deserved runners up trophy. Ms. Sarah D'Souza was crowned Ms. Kynesis. In the individual events our students secured the

DECEMBER 6

- 1st place for the Fitness surprise event, Face painting
- 2nd place for Kinetics reel, Chem Sharks, Treasure hunt, Singing, Fashion show and Dance competition.

The participants for the events were:

- Fashion show: Ms. Sarah D'Souza, Ms. Harshita Haldankar, Ms. Harshita Shirlekar, Ms. Pranita Vaigankar and Ms. Tanisha Shidruk),
- Dance: Ms. Sarah D'Souza, Ms. Pranita Vaigankar, Ms. Harshita Shirlekar, Ms. Michele Barreto and Ms. Shravani Shetye,
- Singing: Ms. Michele Barreto and Ms. Lizanne Mascarenhas,
- Surprise event: Mr. Callum De Souza and Mr. Vedant Shetgaonkar,
- Quiz: Ms. Sanjana Pirankar and Ms. Lyza Mascarenhas,
- Miss Kynesis: Ms. Sarah D'Souza,
- Face painting: Ms. Heetal (artist) and Ms. Harshita Haldankar (model),
- Treasure hunt: Mr. Babaji Gawas and Ms. Pranita Vaigankar,
- Wealth out of waste: Ms. Harshita Shirlekar and Ms. Tanisha Shidruk.

Ms. Sheryl D'Cruz and Dr. Mira Parmekar mentored and accompanied the students.

## Third place winners in All Goa Chemistry Quiz

Our students, Ms Michele Barreto and Ms Utkarsha Kotkar, students of T.Y.BSc. won the 3rd place in All Goa Chemistry Quiz Competition organized by ACT (All Chemistry Teachers) Goa at Goa University.

MARCH 28

# PRESENTATIONS

## Participation in 18th Annual One Day Symposium on 'Fascinating World of Chemical Sciences: Chemistry Fest

Our T. Y.B.Sc. Chemistry students participated in the 18th Annual 'Chemistry Fest' at Goa University. Attended by Chief Guest Shri. Sudesh Velip (Dy. SP, Porvorim), the symposium featured our students showcasing their research through various oral and poster presentations.

MARCH 14

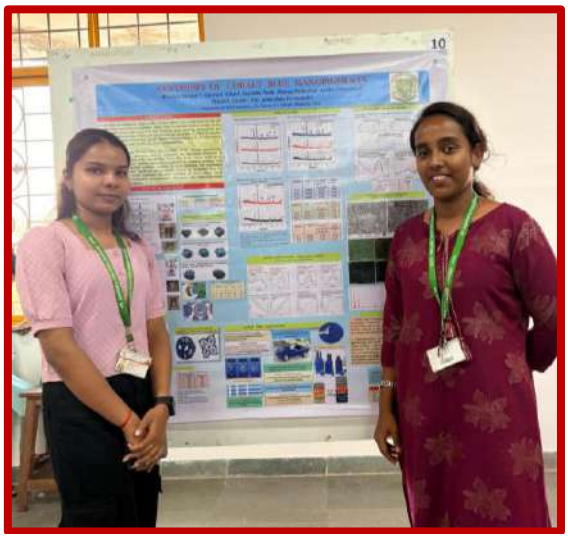
### Oral presentation

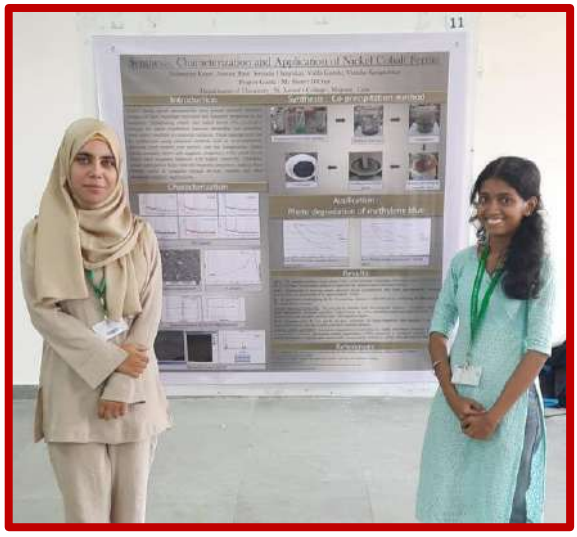
Mr. Sudhanshu Haldankar delivered an oral presentation on his project 'Synthesis and Antimicrobial Studies of some Heterocyclic Compounds'.


### Poster presentations

Ms. Krusiya Sawant presented her research work titled 'Synthesis of Cobalt Blue Nanopigments' and she was awarded the third prize for her project work.

Ms. Aurooj Bhat presented her research work in the form of a poster Presentation. The title of the poster was 'Synthesis, Characterization, and Application of Nickel Cobalt Ferrite'.



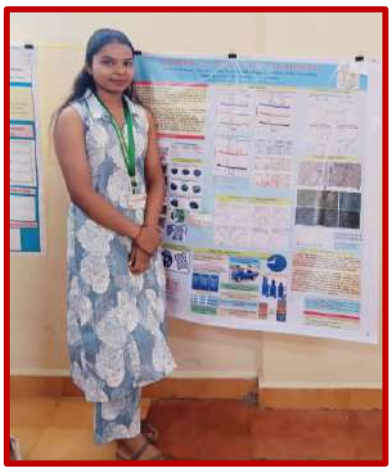




The symposium also provided ample networking opportunities and emphasized the importance of innovation in chemical sciences. Overall, the 'Chemistry Fest' served as an excellent platform for budding chemistry students to bridge the gap between academic learning and professional scientific deliberations.

## Participation in Intercollegiate T.Y.B.Sc. Project Poster Presentation Competition

MARCH 27

An Intercollegiate T. Y. B.Sc. project poster presentation competition was organized by ADVAIT Club of Reseach, Development & Innovation Cell by P.E.S's Ravi S. Naik College of Arts & Science where Ms. Krusiya Sawant and Ms. Gauravi Chari presented their work which was guided by Ms. Janesline Fernandes.



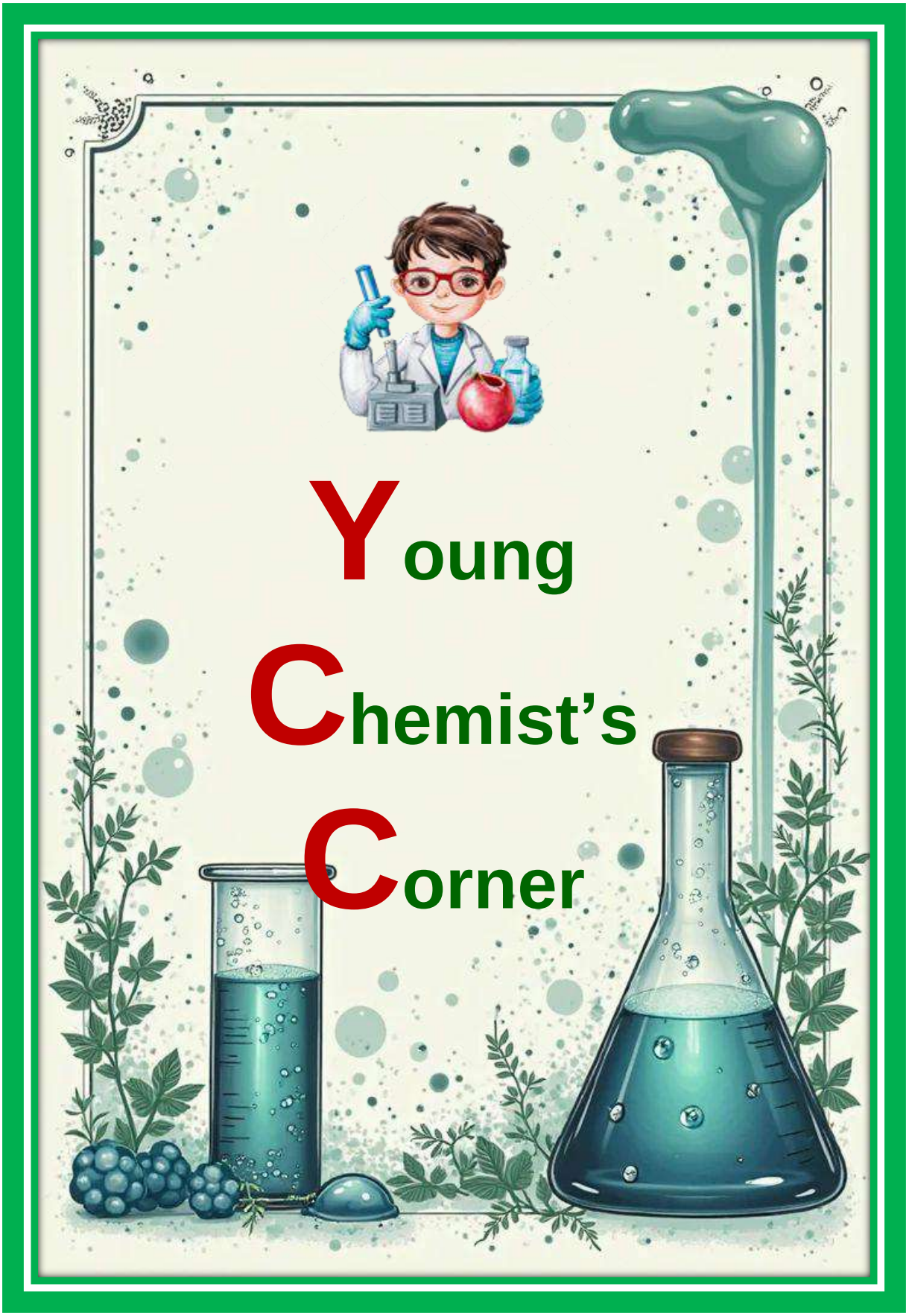
# PROGRAMMES ATTENDED

## State Level workshop at Khandola

Seven students from the Department of Chemistry attended a State Level Workshop on “Exploring Chromatographic and Spectroscopic Techniques for Characterization of Substances”, held at Government College of Arts, Science and Commerce, Khandola, Marcel, Goa, on **10th** and **11th February 2026**. The students who participated were Ms. Mitali Shetgaonkar, Ms. Tanvi Shirodkar, Ms. Utkarsha Kotkar, Ms. Fatima Sheikh, Ms. Shruti Salgaonkar, Ms. Pradnya Shetye, and Ms. Nutan Varadkar.

The workshop provided a comprehensive combination of theoretical knowledge and hands-on training in key analytical techniques. Topics covered included Thin Layer Chromatography, Column Chromatography, Gas Chromatography, High Performance Liquid Chromatography (HPLC), UV–Visible Spectroscopy, Infrared Spectroscopy, Nuclear Magnetic Resonance (NMR) Spectroscopy, Mass Spectrometry, and Flame Photometry.


The sessions were conducted by experts from CSIR–National Institute of Oceanography, BITS Pilani, and Goa University, offering students valuable exposure to modern instrumentation and analytical practices. Participation in the workshop significantly enhanced the students’ understanding of instrumental methods and improved their practical laboratory skills and confidence.


Young
Chemist's
Corner

# Beyond Acids and Bases: Super Acids and Super Bases

As we know in chemistry, an acid is any hydrogen-containing substance that is capable of donating a proton (hydrogen ion) to another substance. A base is a molecule or ion able to accept a hydrogen ion from an acid. Have you ever wondered if there are acids and bases stronger than the regular ones and which go beyond the pH scale?

These are called super acids and super bases. Super acids and super bases are extremely powerful chemical substances that play an important role in modern chemistry. Their unique properties help scientists develop new materials, medicines, fuels, and advanced chemical processes.

## What are super acids?

A super acid is any acid stronger than 100% pure sulfuric acid. Their strength is measured using the Hammett acidity function ($H_0$), which extends beyond the normal pH scale. Super acids are a special class of acids that are much stronger than ordinary mineral acids like hydrochloric acid or sulfuric acid.

These acids are capable of donating protons ($H^+$ ions) extremely easily, making them highly reactive and useful in advanced chemical processes. Super acids can protonate substances that normal acids cannot, including hydrocarbons. Because of this extraordinary ability, they are widely used in chemical synthesis and industrial reactions.

Super acids are generally divided into two categories:

1. Brønsted super acids: donate protons very easily.
2. Lewis super acids: accept electron pairs strongly.

## Examples of Super Acids

1. **Fluoroantimonic Acid:** Fluoroantimonic acid is considered one of the strongest known super acids. It is formed by mixing hydrofluoric acid (HF) with antimony pentafluoride ($SbF_5$).
2. **Magic Acid:** Magic acid is a mixture of fluorosulfuric acid and antimony pentafluoride. It gained fame because it can dissolve hydrocarbons and stabilize carbocations.
3. **Triflic Acid:** Triflic acid is widely used in organic chemistry due to its strong acidity and chemical stability.
4. **Carborane Acids:** Carborane acid are among the strongest isolated acids while also being relatively non-corrosive.

## Uses of Super Acids

1. **Petroleum Industry:** Super acids are used in refining crude oil and producing high-octane gasoline through alkylation processes.
2. **Organic Synthesis:** Chemists use super acids to create complex organic molecules, pharmaceuticals, and polymers.
3. **Research on Carbocations:** Super acids help stabilize carbocations, allowing scientists to study reaction mechanisms in detail.
4. **Production of Chemicals:** They are used in manufacturing plastics, detergents, dyes, and synthetic materials.

## Why Super Acids Are Important?

- **Enable Difficult Chemical Reactions:** Super acids can perform reactions impossible with ordinary acids.
- **Industrial Significance:** Many industrial products depend on processes involving super acids.
- **Scientific Research:** They help scientists understand molecular structures and reaction pathways.
- **Development of New Materials:** Research involving super acids contributes to advancements in advanced materials and catalysts.

## What Are Super Bases?

A super base is a base with exceptionally high proton-accepting ability. These bases are often formed by combining strong alkali metal compounds with organic molecules.Super bases are extremely strong bases that are far more powerful than common bases such as sodium hydroxide or ammonia.

These substances are capable of removing protons from very weak acids and are highly valuable in chemical synthesis and industrial chemistry.Super bases are usually very reactive and must be handled carefully because they react quickly with water and air.

They are commonly used to:

- Remove weakly acidic hydrogen atoms
- Create reactive intermediates
- Drive difficult chemical reactions

## Examples of Super Bases

1. **Lithium Diisopropylamide (LDA):** Lithium diisopropylamide is widely used in organic synthesis to remove protons selectively.

2. **Sodium Hydride:** Sodium hydride is used for deprotonation reactions and preparation of organic compounds.
3. **Butyllithium:** n-Butyllithium is a highly reactive organolithium compound commonly used in laboratories.
4. **Schlosser's Base:** Schlosser's base is an extremely powerful super base used in advanced synthesis.

## Uses of Super Bases

1. **Organic Chemistry:** Super bases are used to synthesize pharmaceuticals, dyes, and polymers.
2. **Formation of Carbanions:** They help create carbanions, which are important intermediates in organic reactions.
3. **Polymer Production:** Certain plastics and synthetic rubbers are manufactured using reactions involving super bases.
4. **Research Applications:** Scientists use super bases to study reaction mechanisms and molecular behavior.

## Why Super Bases Are Important?

- **Drive Complex Reactions:** Super bases make difficult chemical transformations possible.
- **Essential in Synthesis:** Many modern medicines and advanced chemicals require reactions involving super bases.
- **Increase Reaction Efficiency:** They often improve reaction speed and yield.
- **Support Scientific Innovation:** Research involving super bases contributes to new discoveries in chemistry and materials science.

## Conclusion

Super acids and super bases are among the most powerful chemical substances known. Their extraordinary ability to donate or accept protons makes them essential in industrial chemistry, scientific research, and advanced organic synthesis. Although highly reactive and sometimes dangerous, they play a crucial role in producing fuels, medicines, plastics, and many other important materials used in modern life.

***Ms. Prerna Mhamal,***
***TY Chemistry student 2026 – 2027***

# Agricultural Use of Chemistry

## 1. Inputs & Crop Protection

Chemistry is the backbone of modern farming. Synthetic fertilizers like urea, DAP, and potash provide N-P-K - nitrogen for leaf growth, phosphorus for roots/flowers, potassium for overall strength. Without them, crop yields would be 50-60% lower and we couldn't feed 8 billion people. Pesticides, herbicides, and fungicides are also chemical products. They control weeds, insects, and plant diseases that otherwise destroy crops. Example: glyphosate kills weeds so farmers don't need 10x labor for weeding. Soil pH is adjusted using lime or sulfur so nutrients become available to plants. Basically, chemistry turns "unproductive land" into high-yield farms.

## 2. Soil Health, Post-Harvest & Sustainability

Beyond growing, chemistry protects crops after harvest. Chemical preservatives and controlled atmosphere storage stop fungal growth and spoilage, so wheat, rice, and fruits last months instead of days. Soil testing labs use chemical analysis to tell farmers exact nutrient deficiencies - so they add only what's needed, reducing waste and cost. Newer "green chemistry" is pushing biofertilizers, slow-release fertilizers, and eco-friendly pesticides to cut pollution from runoff. The challenge: balance yield vs environment. Too many chemicals result in soil degradation, water pollution. Too few = food shortage. So modern agriculture uses chemistry smartly, right dose, right time, right place.

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# Chemistry of Food Adulteration

## Introduction

Food is one of the basic necessities of life, providing the nutrients required for growth, energy, and overall well-being. However, with increasing demand and commercial competition, the problem of food adulteration has become a serious concern worldwide. Food adulteration refers to the deliberate addition, substitution, or removal

of substances in food products to increase quantity, improve appearance, or reduce production costs. While adulteration may seem economically beneficial to sellers, it poses significant health risks to consumers. Chemistry plays a vital role in identifying adulterants, understanding their effects, and ensuring food safety.

## What is Food Adulteration?

Food adulteration occurs when inferior, harmful, or unauthorized substances are added to food or when valuable components are removed. Adulterants may be physical, chemical, or biological in nature. Common examples include adding water to milk, artificial colors to spices, chalk powder to flour, and synthetic chemicals to fruits and vegetables.

## The Chemistry behind Food Adulteration

Food adulteration involves various chemical compounds that alter the composition and properties of food. Some common adulterants and their chemical nature are discussed below:

### 1. Adulteration in Milk

Milk is one of the most commonly adulterated food products. Water is often added to increase volume, reducing its nutritional value. More dangerous adulterants include:

- Urea [$CO(NH_2)_2$]: Added to increase apparent protein content.
- Detergents: Create froth and mimic the texture of pure milk.
- Formalin (aqueous formaldehyde): Used as a preservative but is toxic and carcinogenic.

### 2. Adulteration in Spices

Spices are frequently adulterated to enhance color and weight.

- Lead Chromate ($PbCrO_4$) is added to turmeric powder to improve its yellow color.
- Artificial dyes such as Metanil Yellow are mixed with spices and sweets to make them visually appealing.

These compounds contain toxic metals and synthetic chemicals that can damage the liver, kidneys, and nervous system.

### 3. Adulteration in Oils

Edible oils may be mixed with cheaper oils to maximize profit.

- Argemone oil, extracted from Argemone seeds, is sometimes mixed with mustard oil.
- Consumption of argemone oil can cause epidemic dropsy, characterized by swelling, heart problems, and vision disorders.

### 4. Adulteration in Fruits and Vegetables

To improve appearance and accelerate ripening:

- Calcium Carbide ($CaC_2$) is used for artificial ripening of fruits such as mangoes and bananas.
- Calcium carbide reacts with moisture to produce acetylene gas, which mimics the action of natural ripening hormones.
- The compound may contain traces of arsenic and phosphorus, making it hazardous to health.

### 5. Adulteration in Sweeteners

Honey and sugar products are often adulterated with glucose syrup, invert sugar, or artificial sweeteners to reduce production costs. Such adulteration lowers nutritional quality and may affect individuals with diabetes.

## Health Hazards of Food Adulteration

The consumption of adulterated food can lead to both short-term and long-term health effects, including:

Food poisoning, allergic reactions, gastrointestinal disorders, liver and kidney damage, neurological problems, cancer due to prolonged exposure to toxic chemicals.

Children, elderly individuals, and people with weakened immune systems are particularly vulnerable.

## Detection of Food Adulteration

Chemistry provides several techniques for detecting adulterants:

### Simple Household Test

- Detection of starch in milk using iodine solution.
- Identification of artificial colors in spices by dissolving samples in water.
- Detection of chalk powder in flour using dilute hydrochloric acid.

### Laboratory Techniques

- Chromatography
- Spectroscopy
- Mass spectrometry
- High-Performance Liquid Chromatography (HPLC)

These advanced analytical methods help identify even trace amounts of adulterants with high accuracy.

## Preventive Measures

To minimize food adulteration:

- Purchase food from trusted sources.
- Check quality certification marks such as FSSAI standards.
- Avoid excessively bright-colored foods.
- Read labels carefully before purchasing packaged products.
- Create public awareness about food safety and consumer rights.

## Conclusion

Food adulteration is not merely an economic fraud but a significant public health issue. The chemistry of food adulteration helps us understand how harmful substances alter food composition and affect human health. Advances in analytical chemistry have greatly improved our ability to detect adulterants and ensure food quality. As informed consumers and responsible citizens, we must remain vigilant and promote awareness about safe and authentic food practices. Ensuring food purity is a collective responsibility that contributes to a healthier society and a safer future.

"Pure food is not a luxury; it is a fundamental right of every individual."

***Callum Caetano De Souza***

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# THE CHEMISTRY IN YOUR COFFEE CUP

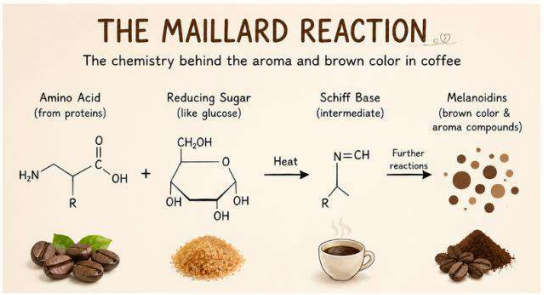
## INTRODUCTION

For many of us, the day doesn't truly begin until we have our first cup of coffee. Whether it's before a lecture, during late-night study sessions, or while catching up with friends, coffee has become a part of college life. But behind its rich aroma and comforting taste lies an amazing world of chemistry.

Every cup of coffee contains hundreds of chemical compounds that influence its flavour, aroma, and the way it affects our body.

## The Chemistry of Roasting

Coffee beans are naturally green and have very little aroma. During roasting, they undergo several chemical changes. One of the most important is the Maillard reaction, in which sugars react with amino acids to produce the brown colour and rich flavours we associate with coffee. This process creates hundreds of aroma compounds, giving coffee notes of chocolate, caramel, nuts, or even fruit, depending on the type of bean and roasting conditions.

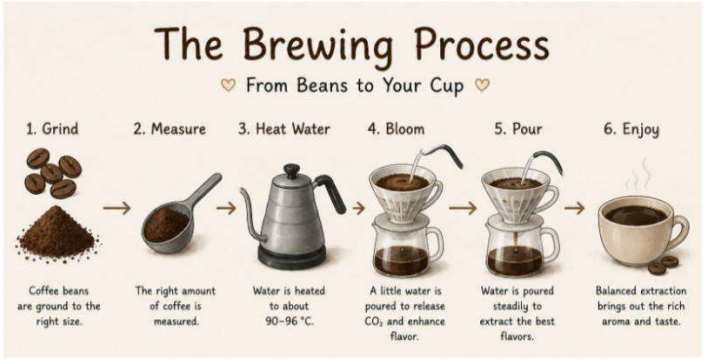



## Why does coffee wake us up?

The secret lies in caffeine, a natural compound found in coffee beans. Throughout the day, our brain produces a chemical called adenosine, which makes us feel tired. Caffeine blocks the action of adenosine, making us feel more awake and alert. This is why a cup of coffee often improves concentration during long hours of studying.
However, too much caffeine can lead to restlessness, anxiety, or difficulty sleeping, so moderation is always important.

## Brewing is Chemistry too

Making coffee is more than simply pouring hot water over ground beans. Water acts as a solvent, extracting caffeine, acids, sugars, and flavour molecules.
The taste depends on factors such as water temperature, brewing time, and grind size. Water that is too hot may produce a bitter coffee, while cooler water may result in a weak and sour taste.




## Did you know??

- More than 800 aroma compounds have been identified in roasted coffee, making it one of the most chemically complex beverages in the world.

- Coffee plants naturally produce caffeine as a defence against insects.
- Decaffeinated coffee is not completely caffeine-free—it simply contains much less caffeine than regular coffee.

## Conclusion

Coffee is much more than a beverage that helps us stay awake. It is a perfect example of chemistry in everyday life, from the roasting of beans to the extraction of flavours and the action of caffeine in our brain. The next time you enjoy your favourite cup of coffee, remember that every sip is the result of fascinating chemical reactions that transform a simple bean into one of the world's most loved drinks.

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# *Chemistry Used in the International Space Station (ISS)*

Abstract: Chemistry is fundamental to life-support systems aboard the International Space Station (ISS). It enables recycling of water, production of oxygen, removal of carbon dioxide, purification of air, preservation of food, and advanced scientific research under microgravity conditions. This article summarizes the major chemical principles used aboard the ISS and their importance for long-duration human spaceflight.

## Introduction

The ISS is an orbiting laboratory where astronauts live and work for months. Since resupplying every resource from Earth is impractical, chemic al technologies are used to recycle water, regenerate oxygen, and maintain a safe atmosphere. These systems reduce mission costs and support future exploration missions.

## Water Recovery

Water from humidity, sweat and urine is purified using filtration, adsorption, ion exchange and catalytic oxidation. The treated water is continuously monitored to ensure it is safe for drinking and scientific use.

## Oxygen Generation

Water undergoes electrolysis, splitting into oxygen and hydrogen. Oxygen replenishes cabin air, while hydrogen may be reacted with carbon dioxide in the Sabatier process to recover additional water.

## Carbon Dioxide Control

Carbon dioxide exhaled by astronauts is removed using regenerative sorbent systems. Maintaining low CO2 levels is essential for crew health and spacecraft safety.

## Air Purification

Activated carbon filters and catalytic oxidizers remove trace contaminants such as volatile organic compounds, ensuring high indoor air quality.

## Chemistry Research

Scientists investigate combustion, crystal growth, corrosion, polymers, protein crystallization and advanced materials in microgravity, leading to discoveries that benefit medicine and engineering on Earth.

## Future Applications

The chemical technologies demonstrated on the ISS are expected to support sustainable missions to the Moon and Mars by reducing dependence on Earth-based supplies.

## Conclusion

Chemistry is indispensable aboard the ISS. From life-support systems to cutting-edge research, chemical science enables humans to live safely in space while advancing scientific knowledge for future exploration.

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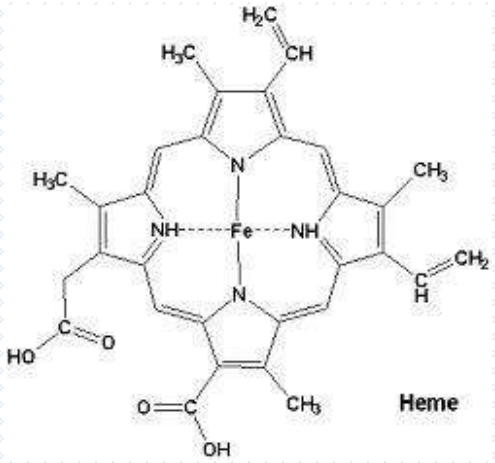
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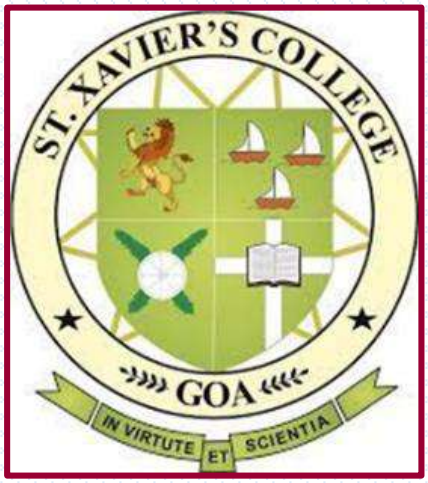
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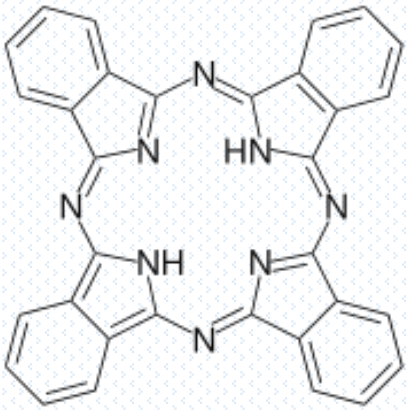

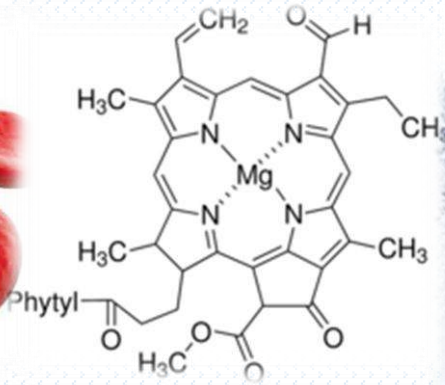
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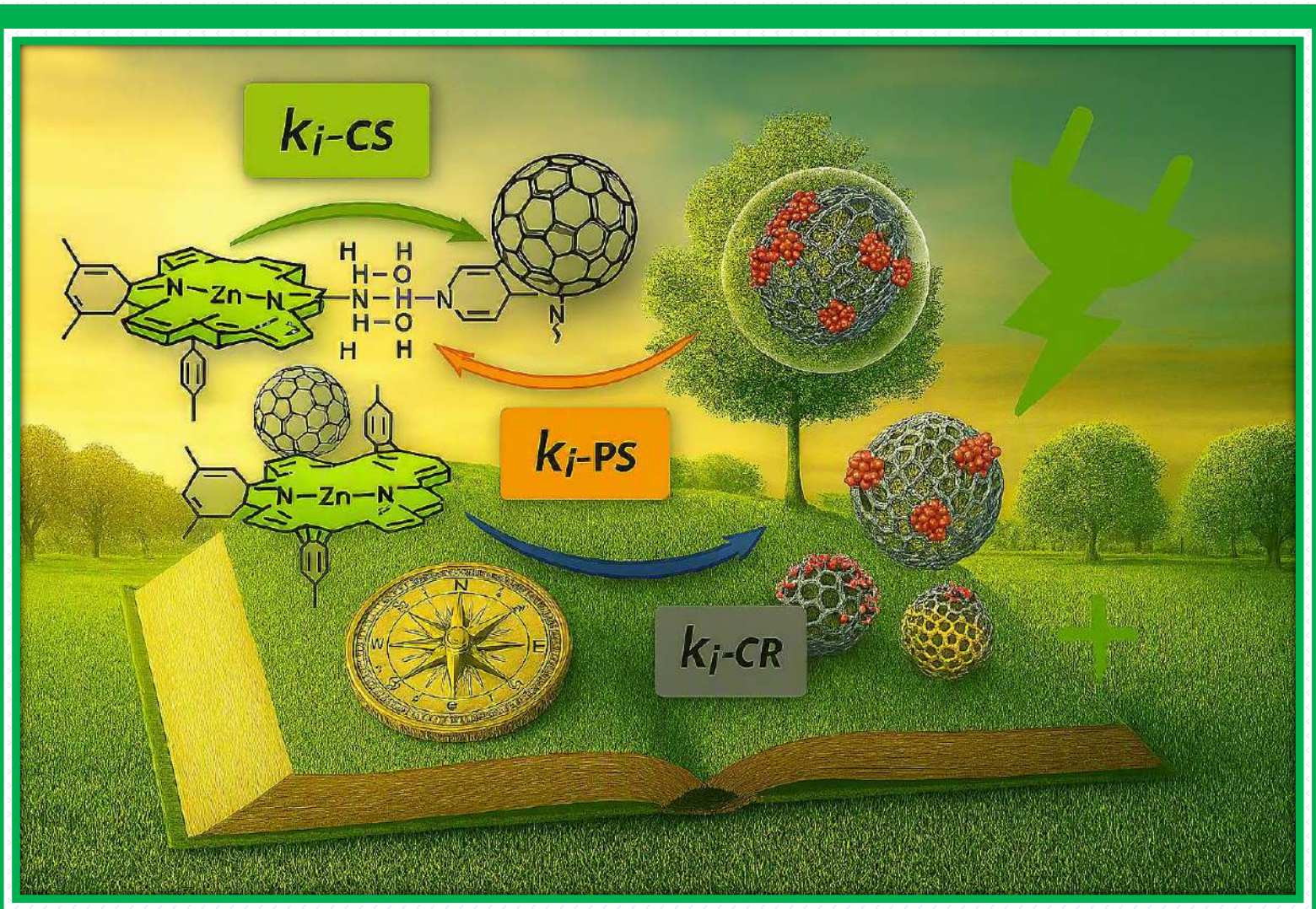
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