



# JNANA CHETANA

Where Science meets Innovation

## Shriram Institute for Industrial Research Bengaluru



## A Tribute to the Architect of Modern Mysore: Sir M. Visvesvaraya



As we at the Shriram Institute for Industrial Research explore the confluence of science and innovation, it is only fitting to honor the legacy of a man who embodied this very spirit in the heart of our region: Sir Mokshagundam Visvesvaraya. Revered as a national icon and fondly remembered as Sir MV, his life's work is a powerful testament to how engineering and visionary thinking can lay the groundwork for a prosperous future.

Born on September 15, 1861, in a village not far from where our institute stands today, Sir MV's journey was one of extraordinary brilliance and unwavering dedication. After a distinguished academic career, he embarked on a path that would see him solve some of the country's most pressing engineering challenges.

### Pioneering Innovations in Engineering

Sir MV was a master of hydrology and water management. His most significant contributions were not just structures, but entire systems that transformed the landscape and lives of millions:

- **Patented Floodgates:** He designed and patented a system of automatic weir water floodgates. First installed at the Khadakwasla Reservoir in Pune, these gates were an engineering marvel, allowing for the automatic release of floodwater and increasing the reservoir's storage capacity without compromising safety.
- **Taming the Kaveri:** As the Chief Engineer of Mysore State, he conceptualized and supervised the construction of the monumental Krishna Raja Sagara (KRS) Dam. This project was a lifeline for the region, converting vast tracts of arid land into fertile fields for agriculture and ensuring a stable water supply.
- **Savior of Hyderabad:** Following the

devastating Musi river flood of 1908, Sir MV was called upon to design a comprehensive flood protection and sewage system for the city of Hyderabad, a plan that has protected it for over a century.

### A Statesman with a Scientific Vision

In 1912, his genius was recognized with his appointment as the Diwan of Mysore. In this role, he proved to be a remarkable statesman, passionately advocating for industrialization, education, and economic planning. His tenure saw the establishment of foundational pillars of our state, including:

- The Mysore Soap Factory
- The Bhadravati Iron and Steel Works
- The State Bank of Mysore
- The University of Mysore
- The Government Engineering College, Bangalore (now UVCE)
- A firm believer in progress, his famous motto was, "**Industrialise, or perish.**"

### An Enduring Legacy of Integrity

Knighted by the British in 1915 and awarded the Bharat Ratna in 1955, Sir MV's life was a lesson in discipline and integrity. His birthday, September 15th, is celebrated across India as **Engineer's Day**, a fitting tribute to a man who engineered a modern nation.

As we forge ahead with our own research and innovations, we are inspired by the towering legacy of Sir M. Visvesvaraya—a true titan who proved that with scientific acumen and a commitment to service, one can truly build a better world.

**Note:** This issue cover tribute to **Sir M. Visvesvaraya**



# JNANA CHETANA

Where Science meets Innovation

## Quality's SRI-B

The Shriram Institute for Industrial Research, Bengaluru (SRI-B) conducts high-quality contract research and testing across diverse industrial sectors, leveraging state-of-the-art facilities, analytical precision, and strong quality assurance. The institute provides reliable services in Materials Science, Analytical Science, and Calibration, helping industries achieve the highest standards of product quality. Its commitment to innovation also extends to research in renewable resources and waste to wealth.

A key component of SRI-B is the Quality Assurance Division (QAD), which ensures the delivery of quality services to customers with utmost confidence, in full compliance with regulatory and statutory requirements. QAD's primary objective is the implementation and effective functioning of a robust Quality Management System (QMS) at all levels, guaranteeing consistency and excellence in every service provided.

## HIGHLIGHTS

- Shriram Institute for Industrial Research, Bangalore (SRI-B) strengthened research and business ties by signing MoUs with Biosustain Pvt. Ltd, Hycons Bioenergy Park, SANF Greenmens Pvt. Ltd, and Surana College for research, product development, business expansion, and skill development initiatives.
- Ideation sessions and collaborative discussions were held with leaders from AgriHub and SANF. Technical and R&D teams visited Bangalore University for joint project collaborations in environmental science and EIA-related studies.
- SRI-B hosted its first customer meet and welcomed industry representatives from SKF Global Technical Centre, Aerospace Engineers Pvt. Ltd, Tarshcon, and NQAC Moga to discuss testing, product validation, and "Waste to Wealth" initiatives.
- The institute celebrated the 79<sup>th</sup> Independence Day with flag hoisting and launched its e-newsletter, "Jnana Chetana" fostering knowledge sharing and team spirit.

## TOP NEWS

- SRI-B enrolled all employees under a group medical insurance policy on 28.07.2025 as part of its staff welfare initiative.
- Representatives from NQAC Moga and the Engineering Division, Nanjangud, visited SRI-B on 05.08.2025 to discuss testing requirements with the technical team.
- The Tarshcon team visited SRI-B on 05.08.2025 to discuss testing of products developed from poly waste under the "Waste to Wealth testing support from SRI-B" concept.
- SRI-B conducted its first-ever customer meet on 13.08.2025, strengthening client relationships and industry collaboration.
- The Aerospace Engineers Private Limited team visited SRI-B on 22.08.2025 to discuss testing of composite raw materials used in Active Antenna Array Unit (AAAU) components.



## IMPORTANT EVENTS

### Expands Collaborative Network through MoUs

SRI-B strengthened research and business ties by signing MoUs with Biosustain Pvt. Ltd, Hycons Bioenergy Park, SANF Greenmens Pvt. Ltd, and Surana College for research, product development, business expansion, and skill development initiatives.



### SRI-B Pays Tribute to Shri Tilak Dhar Ji on His Memorial Day

On 01.07.2025, SRI-B organized a solemn flower tribute to honour the memory of Late Shri Tilak Dhar on his death anniversary, reflecting the Institute's respect and remembrance for his contributions. Continuing the commemoration, a one-day cricket tournament was held on 05.07.2025, bringing together staff and students in a spirit of sportsmanship and camaraderie while honouring his legacy.



### Celebration of Engineer's Day

SRI-B celebrated Engineer's Day on 15.09.2025 to honor Sir M. Visvesvaraya and recognize the invaluable role of engineers in nation-building. The event highlighted the theme "Deep Tech & Engineering Excellence Driving India's Future," with activities and presentations emphasizing innovation, technology, and engineering contributions to societal development.



### Earthquake Emergency Training & Mock Drill

demonstrating its commitment to staff safety and preparedness, SRI-B conducted an Earthquake Emergency – Training and Mock Drill on 08.08.2025. The activity provided hands-on training for emergency response, helping staff practice safety protocols and enhancing the Institute's overall disaster preparedness framework.



## IMPORTANT EVENTS

### Customer Meet Program

On 13 August 2025, SRI-B organized an interaction session with QA Heads and Business Development teams from various companies to discuss collaboration opportunities and strengthen industry partnerships.



### Independence Day Celebration and Jnana Chetana Launch

SRI-B celebrated Independence Day with patriotic enthusiasm, marked by the hoisting of the national flag on 15 August 2025. On the same day, SRI-B launched its e-newsletter titled “JNANA CHETANA” The newsletter serves as a platform to connect all internal stakeholders and highlight the institute’s key developments, achievements, and ongoing activities, fostering a sense of unity and knowledge sharing within the organization.



### Visit from NQAC Moga and Engineering Division, Nanjangud to Discuss Testing Collaborations

On 5 August 2025, representatives from NQAC Moga and the Engineering Division, Nanjangud visited SRI-B to engage with the technical team. The discussion focused on understanding testing requirements, exploring potential collaboration opportunities, and strengthening technical partnerships for future projects.



## NAMMA NEW TEAM NAMMA PRIDE



**Mr. Karthikeyan S**

Jr. Engineer `A`  
Engineering & Maintenance



**Ms. Priya S**

Project Trainee  
Front Office



**Mr. Sumit Kishor**

Asst. Executive `A`  
Marketing



**Ms. Meghana K S**

Jr. Executive `B`  
HR

## SCIENTIFIC ARTICLES

# Milk Fat: Composition, Functionality, and Nutritional Relevance

-Sunitha C

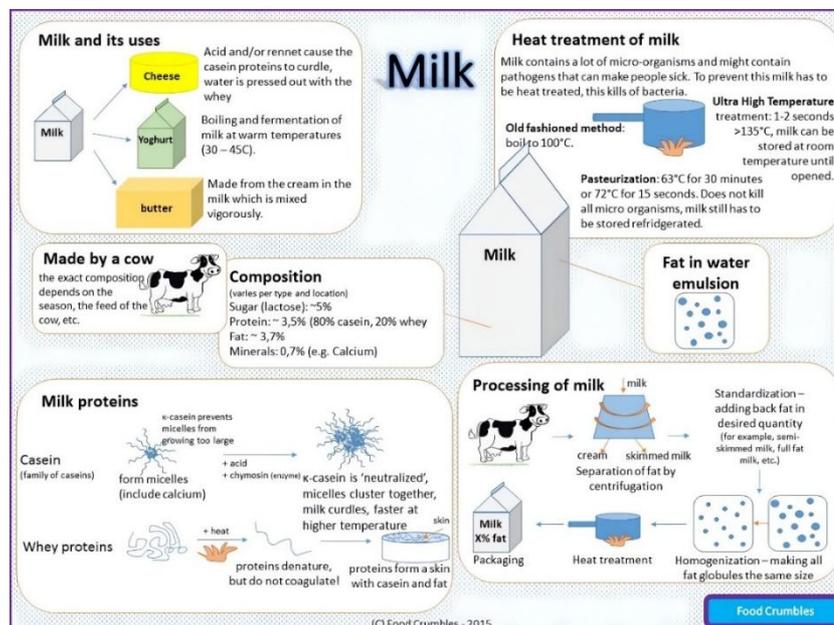
Milk fat is one of the most intricate natural lipids, contributing substantially to the health value, processing properties, and sensory qualities of dairy products. In bovine milk, it typically ranges from 3% to 6%, with triacylglycerols (TAGs) making up nearly 98% of the total lipid fraction. Within these TAGs, more than 400 different fatty acids have been identified, spanning from short-chain types such as butyric acid (C4:0) to long-chain polyunsaturated fatty acids. This structural diversity renders milk fat the most complex lipid source of natural origin. The remaining portion is composed of cholesterol, phospholipids, mono- and diacylglycerols, and fat-soluble vitamins (A, D, E, and K), all of which support human health and product stability.

For decades, milk fat has been criticized due to its relatively high level of saturated fatty acids. However, recent findings indicate that it offers far more than energy storage, as several of its bioactive compounds exert health-promoting functions. Components such as conjugated linoleic acid (CLA), butyric acid, and sphingolipids display anti-inflammatory, anti-carcinogenic, and cardio metabolic benefits. The milk fat globule membrane (MFGM), enriched with bioactive phospholipids and glycoproteins, is gaining recognition for its role in brain

development, immune defence, and intestinal health. Importantly, the impact of dairy consumption appears to be influenced by the “dairy matrix effect,” where the combined action of nutrients modifies the physiological outcomes compared with isolated fat components.

In terms of functionality, milk fat is vital for the physical and sensory quality of dairy products. Its crystallization behaviour, melting range, and emulsifying capacity govern spread ability, smoothness, and flavour release in products such as butter, cheese, and frozen desserts. Recent advances in fractionation and encapsulation technologies now permit the separation and stabilization of specialized lipid fractions, enabling the development of infant nutrition products, medical foods, and functional dairy formulations.

In conclusion, milk fat is no longer regarded simply as a concentrated source of saturated fat, but rather as a highly bioactive lipid system with multifunctional roles. Its contribution to health, combined with its irreplaceable technological functions, makes it a critical component in both nutrition science and food innovation.



## SCIENTIFIC ARTICLES

### Environment and Climate Change

# A Tale of Two Cities: Heat and Rain in Urban India

-Uday kumar

#### Heat and Rain: The Twin Crises Shaping Our Cities

Raju, a daily-wage worker in Delhi, wakes before dawn in his tin-roofed home already scorching from the night's trapped heat. By noon, he labors under a 45°C sun with only warm water for relief. Hundreds of kilometres away, Asha, a teacher in Bangalore, faces another extreme. A few hours of torrential rain flood the streets outside her classroom, halting buses and trains. Two cities, two opposite realities—both shaped by climate change and unplanned urbanisation.

#### Why Rains Are More Destructive

Cities now drown after every downpour. Warmer air holds more moisture, leading to sudden cloudbursts. But poor urban design worsens the damage: wetlands are lost, lakes encroached upon, and drains choked with plastic. With nowhere for water to go, floods have become routine in Bangalore, Mumbai, and Chennai.

#### Why Cities Are Getting Hotter

Urban sprawl replaces trees with concrete, asphalt, and glass, trapping heat—a phenomenon

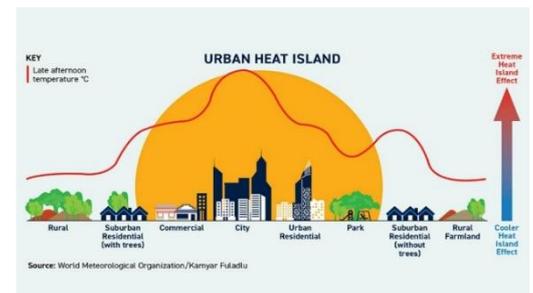
called the *Urban Heat Island* effect. Climate change amplifies it, turning summers deadly. For workers like Raju, rising temperatures mean heatstroke, dehydration, and failing health.

#### What Can Be Done

Solutions exist: tree-lined streets, restored lakes, and protected wetlands can cool and safeguard cities. Some Indian cities are beginning, but action must scale quickly.

#### Conclusion

Raju and Asha represent millions enduring these extremes. The crisis is not just environmental but social and economic. With greener planning and stronger governance, India can build cities that are cooler, safer, and more resilient—turning today's threat into tomorrow's hope.



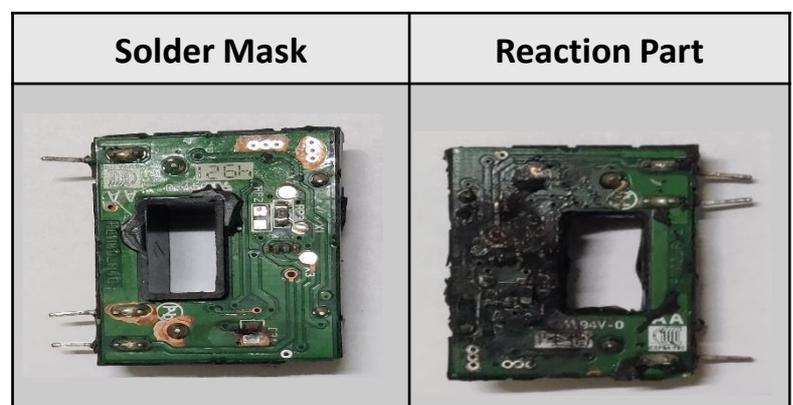
## VIJNANA LOKA

### A Success Story

# Failure analysis of Printed Circuit Board (PCB)

-Ravi Kumar S. P.

A detailed physico-chemical and instrumental evaluation was carried out to identify the root cause of the field failure. The chemical constituents responsible for the failure were established using suitable in-house-developed methodologies. Based on the test results and subsequent technical interpretation, preventive measures were recommended for adoption in future operations.



## SCIENTIFIC ARTICLES

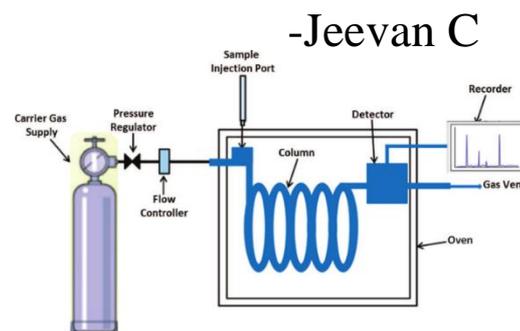
### Beyond Separation: Evaluating the Quantitative Potential of chromatographic techniques in Modern Analysis

Chromatography, traditionally known as a separation technique, is now widely applied in quantitative analysis across pharmaceuticals, food, and environmental sciences. Gas Chromatography (GC) and High-Performance Liquid Chromatography (HPLC) offer precise and accurate quantification, supported by sensitive detectors such as FID in GC and UV-Vis or PDA in HPLC, where peak areas correspond directly to analyte concentration.

Pharmacopoeial methods, such as the paracetamol assay (HPLC) in the Indian Pharmacopoeia and GC methods for pesticide residues, confirm this quantitative capability. Studies consistently show strong linearity ( $R^2 > 0.999$ ) and recoveries within 98–102% when methods are properly validated. Examples include caffeine in soft drinks (HPLC-UV) with  $R^2 = 0.9994$  and recoveries of 99–101%, and pesticide residues in vegetables (GC-ECD) showing LODs of 0.01 mg/kg and recoveries of 95–104%, meeting EU residue limits.

However, chromatography has inherent challenges. Detector responses vary by compound, requiring calibration with standards. Complex matrices may cause co-elution, demanding sample cleanup, while instrumental factors like column aging or solvent variation affect reproducibility—confirming that chromatography is a relative, not absolute, measurement method.

Validated according to ICH Q2 (R1) for linearity, accuracy, precision, and robustness, GC and HPLC remain globally accepted for quantitative work. Applications such as aflatoxin B1 in peanuts (HPLC-FLD), fatty acids in milk (GC-FID), and phenolics in wine (HPLC-UV) demonstrate their versatility, but its success depends on careful method development, calibration, and validation.



-Jeevan C

### Genetically Modified (GMO) Foods: Safety, Risks, and Societal Concerns

-Jayita Banerjee

Genetically Modified (GMO) Foods are bioengineered foods derived from organisms whose genetic material has been altered using genetic engineering. This technology enables the transfer of genes between unrelated species, introducing desired traits such as pest resistance, herbicide tolerance, or improved shelf life—advantages not achievable through traditional breeding. Common GMO crops include soybeans, corn, canola, cotton, papaya, and sugar beet.

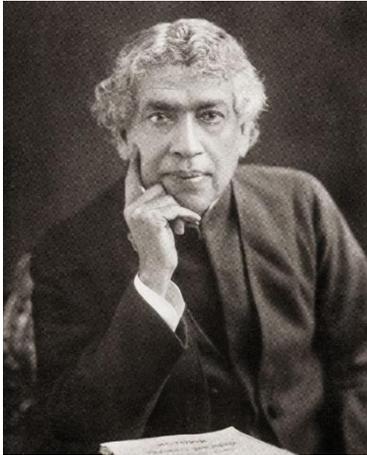
Scientific consensus affirms that currently approved GMO foods are as safe as conventional ones. Institutions like the World Health Organization (WHO), U.S. National Academy of Sciences, European Food Safety Authority (EFSA), and the American Medical Association report no evidence of greater health risks. However, some scientists and advocacy groups express concerns about potential allergen creation, gene transfer to human cells or gut microbes, and

environmental risks such as crossbreeding with wild species, loss of genetic diversity, and pest or “superweed” resistance from overuse of Bt and herbicide-tolerant crops.

Public scepticism persists, often driven by limited transparency, misinformation, and cultural beliefs about “natural” foods. Looking ahead, advanced tools like gene editing (CRISPR-Cas9) promise more precise and potentially less controversial modifications. These could improve nutrition (e.g., Golden Rice enriched with vitamin A), enhance drought tolerance, and reduce chemical inputs. GMO foods thus offer great potential for productivity, food security, and sustainability. Ensuring their success requires transparent communication, equitable access, ethical use, and strong regulation to build public trust and responsibly harness biotechnology’s benefits.

## VIJNANA LOKA

### Pioneer Scientist Sir J.C. Bose's Legacy Celebrated as Modern Tech Catches Up to His Century-Old Vision



KOLKATA, India - Oct. 14, 2025 - As India's tech sector pushes the boundaries of 5G and AI-driven agriculture, the scientific community is pausing to honour the foundational work of a physicist and botanist who foresaw the convergence of these fields over a century ago: **Sir Jagadish Chandra Bose**.

Ahead of his 167<sup>th</sup> birth anniversary next month, institutions across the country, led by the Bose Institute he founded in Kolkata, are holding a series of lectures and symposia celebrating a figure whose pioneering discoveries are proving more relevant than ever.

Experts point out that Bose's groundbreaking experiments with millimeter-wavelength radio waves in the 1890s - work that predated Marconi's more famous transmissions - are the very foundation of modern high-speed wireless communication, including 5G and the emerging 6G spectrum.

"When Sir J.C. Bose first demonstrated the wireless transmission of waves that could pass through walls, it was seen as a form of magic," said Dr. Arnab Sen, a communications researcher speaking at a pre-anniversary event. "Today, that 'magic' is the science powering our interconnected world, from smartphones to the Internet of Things. He was not just ahead of his time; he was building the future."

Simultaneously, Bose's revolutionary work in plant biophysics is finding new life in the fields of precision agriculture and environmental monitoring. His invention, the crescograph, which could measure and record plant growth and responses to stimuli with incredible accuracy, demonstrated that plants possess complex signaling systems.

"His research showing that plants respond to stimuli like light, temperature, and even noise was once met with skepticism in the West,"

commented Dr. Priya Desai, a leading botanist. "Now, we are developing sensor-based agricultural technologies that essentially do what his crescograph did: 'listen' to the needs of plants to optimize water, nutrients, and care. He was the father of plant signaling."

The Bose Institute has announced a week-long celebration beginning November 24th, featuring international speakers who will discuss his dual legacy in physics and life sciences. The event aims to reintroduce his holistic scientific philosophy to a new generation of researchers.

While remembered for his incredible inventions, Bose is also hailed for his principle of making knowledge freely available. He famously refused to patent his radio wave inventions, believing that scientific discoveries belonged to all of humanity - a stark contrast to today's fiercely competitive intellectual property landscape.

As the celebrations unfold, the consensus is clear: Sir Jagadish Chandra Bose was more than a historical figure. He was a visionary whose intellectual curiosity laid the groundwork for technologies that are only now reaching their full potential, securing his legacy not just as a pioneer of the past, but as an architect of the future.

## YUVA VICHARA

# Simplifying the Recycling of Plastics using Nickel-based Catalyst

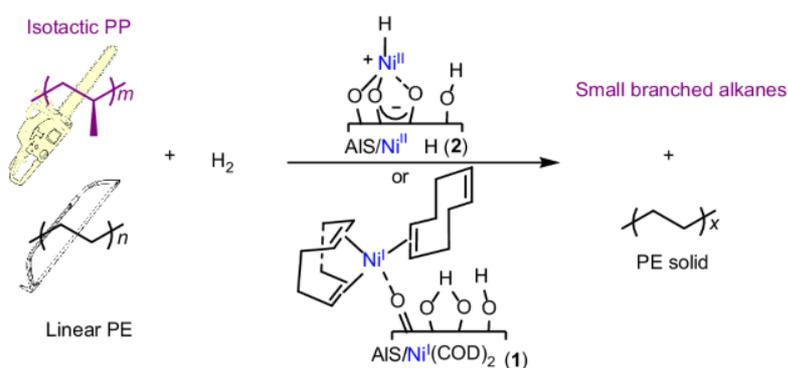
Researchers at Northwestern University have unveiled a groundbreaking nickel-based catalyst that could transform plastic recycling. Unlike traditional methods that rely on labor-intensive sorting of plastic types, this catalyst can efficiently depolymerize mixed polyolefins - such as polyethylene and polypropylene—into valuable liquid products including oils, lubricants, and waxes. Remarkably, it exhibits high tolerance to PVC contamination, a major obstacle in conventional recycling; its performance even improves with up to 25% PVC content.

The catalyst's single-site molecular design allows it to operate under milder temperatures and lower hydrogen pressures while maintaining stability and easy reusability through a straightforward regeneration process. By simplifying operations and reducing costs, this innovation represents a major step toward scalable and sustainable chemical recycling of everyday plastics.

### Reference

Original research published in *Nature Chemistry* (2025).

DOI: 10.1038/s41557-025-01892-y



- Single-electron transfer chemisorption
- Single-site Ni catalyst
- High selectivity for oil product
- Branched C-C >> linear C-C
- Electrophilic Ni centre
- Efficient C-C cleavage
- Stable
- Regenerable

## KNOW YOUR CHEMICALS

### Mercury (Hg)

Mercury is a unique element and the only metal liquid at room temperature, earning the name “quicksilver.” Known since ancient times, it was used in thermometers, barometers, and gold extraction for forming amalgams with other metals. Chemically, it forms compounds like mercuric chloride and toxic methylmercury, which accumulates in aquatic food chains. Its unusual behavior arises from relativistic effects that make it less reactive than most metals. Mercury conducts electricity and expands slightly when frozen—an uncommon trait. Its colorless vapor is highly toxic, causing neurological damage, requiring careful handling. Historically valued in medicine and alchemy, mercury today finds use in precision instruments, fluorescent lamps, and quantum research, though global efforts focus on reducing its environmental and health risks.



## Science Quiz



Which instrument uses both chemical and physical principles to identify unknown compounds?

- a) NMR b) SFC-MS c) IMS-MS  
d) LC-MS e) GC-MS

### Last issue quiz answer

What is the only letter not appearing in the periodic table?

Ans.: J is the only letter missing from the periodic table

# Jnana Chetana

## Editorial Team

1. Mr. S. Manicka Vasagam : Chairman
2. Dr. K.N. Chandrashekar : Convener
3. Mr. D. Nagaraj : Member
4. Mr. K.M. Nagendra Kumar : Member
5. Dr. Guru Prasad, V. : Member
6. Mr. Asweshvaran, R. : Member
7. Ms. Pooja, T. : Member
8. Mr. Jeevan, C. : Member

## SRI-B Forthcoming Events



**Customer Meet Program** - Following the resounding success of our first Customer Meet held in Aug-2025, we are pleased to announce that we will be organizing the second addition in the upcoming quarter.

**Brainstorming Session** - Interacted with partner universities under existing MoUs to explore and initiate collaborative research initiatives.



**Hands-on Training** - For academia focusing on their respective HPLC and GC skill development training

**Vendor Meet** - The first vendor meet will focus on engagement with chemical and instrument suppliers for procurement, technical discussions, and coordination of material and instrument requirements.





**MATERIAL SCIENCE DIVISION**

Building Materials, Rubber & Plastics  
Metals & Minerals, Petroleum Products  
Paints and Inks, General Chemicals  
Paper and Paper Products, Wood and Wood Products  
Pesticides, Insecticides and Fertilizers  
Special Services

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Product Development  
Solutions to Industrial Problems Technical  
Consultancy



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Drug & Pharmaceuticals  
Microbiology

**ENVIRONMENT SCIENCE DIVISION**

Environmental Assessment  
as per Regulatory Requirements,  
Industrial Gases,  
Hospital Hygiene Requirements,  
Water and Soil

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Thermal, Mechanical  
Electrotechnical  
Special Instruments

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