



JANUARY 2025

ISSUE NO: 20





Our Founder & his Vision

Knowledge is the prime wealth among all wealths. In other words, knowledge is the best and important wealth among all wealths. Start your journey to find or explore the knowledge. Our founder and renowned scholar late Padmashri Dr Vellayani Arjunan's vision is to spread quality education to entire community and make it affordable.

Shri. Vellayani Arjunan was born on 10 February 1933 at Vellayani in the erstwhile Kingdom of Travancore. After receiving a Master of Arts degree in Malayalam, he went on to teach Malayalam Language and Literature at

Sree Narayana College in Kollam. He later became the first Malayalam lecturer in Aligarh Muslim University, from which he gained his PhD degree in 1964. After leaving Aligarh Muslim University, he was appointed director of the State Institute of Encyclopaedic Publications in Kerala

He was honoured with the Padma Shri award by the nation in 2008. Dr Arjun, who was the first Professor of Malayalam at the Aligarh University and head of the Department of Modern Indian Languages. He supervised 20 research scholars and published more than 100 research papers and articles. He had authored 40 books in different genres including poetry, short story, essays and literary criticism, and his books were prescribed as textbooks in Kerala schools from 1959 onwards.



Degree	Topic	Awarding Institution
D.Litt.	Influence of Sree Narayana Guru on Malayalam Poetry.	Aligarh Muslim University
D.Litt.	A Comparative Study of the Mutual Relations and Uniformity of Hindi and Malayalam Languages.	Agra University
D.Litt.	The influence of Hindi Vocabularies on the South Indian Languages: A Linguistic study.	Jabalpur University
Ph.D.	A Comparative Linguistic Study of Common Vocables of Hindi and Malayalam Languages.	Aligarh Muslim University

Other degrees

Degree	Subject
B.A. Hons	Malayalam Language and Literature
M.A.	Malayalam Language and Literature
M.A.	Hindi Language and Literature
M.A.	Hindi Special
P.G. Diploma	Tamil, Telugu, Kannada





From the Editors Desk.....

Dear Students & future leaders,

As we step into a brand-new year filled with endless possibilities, we at **The Mentors** Online Platform wish you a year of growth, success, and discovery. Each new year brings a fresh opportunity to turn dreams into achievements, and this year is no different.

We are incredibly proud to see how far you've come on your learning journey. Your resilience, curiosity, and determination to excel, even in the face of challenges, have been inspiring. It is your dedication that motivates us to continue improving and delivering quality education right to your fingertips.

Remember, education is not just about passing exams; it's about cultivating a lifelong love for learning and preparing yourself for a bright future. As your mentors, we are here to support you every step of the way. No dream is too big, and no challenge is too great when you have the right guidance and determination. In this new year, let's set our goals higher, push boundaries further, and continue to believe in the power of learning. Whether you're aiming for academic success, personal growth, or a new skill, trust that every small effort counts towards making a big impact. We look forward to seeing you achieve more milestones this year.

WHAT IS SPECIAL ABOUT THE MONTH OF JANUARY ?

JANUARY 04 : World Braille Day, celebrated annually on January 4, marks the birth anniversary of Louis Braille, the French inventor who revolutionized communication for visually impaired individuals by developing the Braille system. This tactile writing system, based on patterns of raised dots, empowers blind and partially sighted individuals to read and write independently, fostering literacy, education, and self-reliance. The day serves as a global platform to raise awareness about the challenges faced by people with visual disabilities and to advocate for their rights to access information, education, and opportunities on an equal footing with others. Recognized

by the United Nations since 2019, World Braille Day underscores the importance of accessibility, reminding societies and governments of their responsibility to eliminate barriers for people with disabilities. It also highlights the ongoing need to ensure that public spaces, books, technology, and digital platforms are inclusive and accommodating. Through this observance, communities worldwide come together to honor the legacy of Louis Braille and reaffirm their commitment to building an inclusive world where no one is left behind.





The mentors Digest

HUMAN ACTIVITY IS CHANGING EARTH'S TILT AND ROTATION

Scientists have found that human actions, such as groundwater extraction and polar ice melting, are altering Earth's tilt and rotation. These changes highlight the global impact of human activities.

What Is Earth's Tilt?

Earth spins at a tilt of about 23.44° , a feature that creates our seasons. This tilt naturally fluctuates over time, but recent studies reveal that human activity is now a contributing factor.

How Are Humans Changing the Tilt?

The shift in Earth's tilt is caused by the redistribution of its mass. Melting polar ice, driven by global warming, transfers vast amounts of water into the oceans. However, a bigger factor is the extraction of groundwater for agriculture. Since the 1990s, over 23 million cubic kilometers of water have been pumped from underground aquifers and ultimately ended up in the oceans, shifting Earth's balance.

Between 1993 and 2010, this water movement caused the planet's rotational pole to shift by nearly 80 cm (2.6 ft) and raised sea levels by over 6 mm (0.2 in).

Why Does It Matter?

Although these changes don't affect the climate directly, they have significant implications:

1. Planetary Rotation

The redistribution of water mass slows Earth's rotation, lengthening the day by fractions of a second. This effect could accelerate if water extraction and ice melting continue.

2. Technological Challenges

Small changes in rotation and tilt can disrupt systems like GPS and financial networks, which rely on precise timekeeping. Frequent adjustments to these systems may be required in the future.

3. Global Impact

This evidence underscores humanity's power to affect planetary systems on a global scale, refuting the notion that our impact is insignificant.

What Can Be Done?

To reduce further changes, we need to manage water resources more sustainably, adopt better agricultural practices, and curb greenhouse gas emissions. These findings remind us of the interconnectedness of human activity and the planet, urging us to act responsibly for a more stable future.



Did you know ?
The hour and minute hand
of a clock coincide 22
times in a day.



THE YEAR IN COMPUTER SCIENCE: KEY HIGHLIGHTS OF 2024

2024 was a transformative year for computer science, with breakthroughs in AI, quantum computing, and theoretical research.

AI and Chatbots

Researchers made strides in understanding language models like ChatGPT, showing they combine skills in ways beyond their training data. The concept of "grokking" revealed how overtraining can lead to unexpected mastery, though concerns about security and ethics persist.

Quantum Computing Advances

Google achieved a milestone in quantum error correction, demonstrating codes that tolerate critical error thresholds. New algorithms allowed efficient modeling of quantum systems, while progress in quantum cryptography hinted at future applications.

The Busy Beaver Problem

After decades, researchers solved the fifth busy beaver problem, finding the number 47,176,870. However, future busy beaver challenges may lie beyond computational limits.

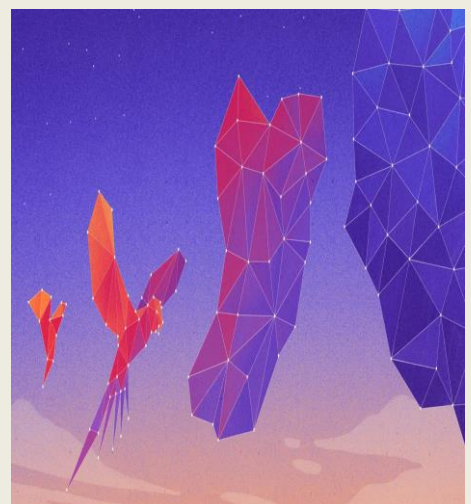
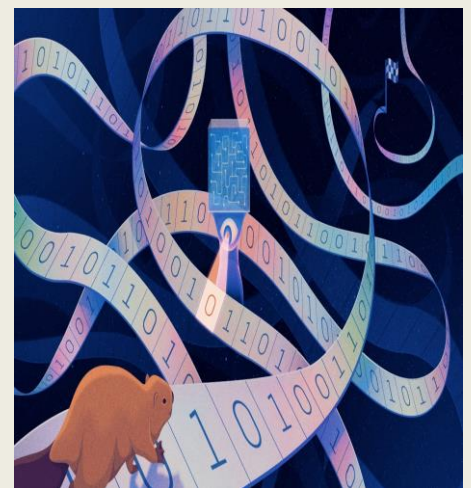
Error-Correcting Codes

Quantum codes using aperiodic tilings showed promise, while a 20-year question about classical codes confirmed their inherent inefficiency.

Game of Life and Computability

Amateurs proved the Game of Life is "omniaperiodic," while Turing machine explorations highlighted the limits of computability.

2024 showcased both breakthroughs and challenges, revealing the vast potential of computer science and the complexities we have yet to conquer.





MASSIVE NEW ENERGY SOURCE DISCOVERED BENEATH EARTH'S SURFACE

A vast reserve of geologic hydrogen, naturally formed through Earth's geochemical processes, has been discovered worldwide. This resource could provide a cleaner alternative to traditional hydrogen production methods, sparking interest and debate about its potential to aid the climate crisis.

What is Geologic Hydrogen?

Unlike hydrogen produced via fossil fuels or electrolysis, geologic hydrogen occurs naturally in the Earth's crust and can be extracted with a much smaller carbon footprint. Currently, Mali is the only place where this extraction is actively taking place.

The Discovery

A study in *Science Advances** estimates global reserves of 5.6 million metric tons of hydrogen. Extracting even 2% of these reserves could yield 1.4×10^{16} joules of energy—enough to power the world for 35 minutes—double the energy in all known natural gas reserves.

Challenges and Benefits

- Benefits:

- Low-carbon extraction process.
- A vast, untapped resource to supplement renewables like wind and solar.

- Challenges:

- Identifying precise reserve locations and accessing them at scale.
- Massive infrastructure needs, including rigs, transport, and storage.
- Diverting focus from established

renewables could slow climate action.

Expert Insights

Prof. Bill McGuire from UCL expresses skepticism, citing time and resource constraints:

“Scaling hydrogen extraction to address emissions would require a global effort we can't afford to delay.” He also emphasizes that well-established renewable technologies like solar and wind remain more viable solutions.

Conclusion

While geologic hydrogen offers a cleaner energy option, questions about scalability, infrastructure, and practicality remain. Its role in the transition to net-zero emissions will depend on balancing this discovery with proven renewable energy solutions.



An ice cube takes up about 9 percent more volume than the water used to make it.



MATHEMATICS TOPIC OF THE MONTH:

DEFINITE INTEGRALS AND APPLICATION OF INTEGRALS

CONCEPT MAP

Class XII

DEFINITE INTEGRALS

For any two values a and b , we have $\int_a^b f(x) dx = [F(x) + c]_a^b = F(b) - F(a)$

Limit of Sum

$$\int_a^b f(x) dx = \lim_{h \rightarrow 0} h[f(a) + f(a+h) + \dots + f(a+(n-1)h)],$$

where $h = \frac{b-a}{n} \rightarrow 0$ as $n \rightarrow \infty$

Fundamental Theorem of Calculus

• **First Fundamental Theorem** : Let $f(x)$ be a continuous function in the closed interval $[a, b]$ and let $A(x)$ be the area function. Then $A'(x) = f(x)$, for all $x \in [a, b]$.

• **Second Fundamental Theorem** : Let $f(x)$ be a continuous function in the closed interval $[a, b]$ and $F(x)$ be an integral of $f(x)$, then

$$\int_a^b f(x) dx = [F(x)]_a^b = F(b) - F(a)$$

Solving by Substitution

When definite integral is to be found by substitution, change the lower and upper limits of integration. If substitution is $t = f(x)$ and lower limit of integration is a and upper limit is b , then new lower and upper limits will be $f(a)$ and $f(b)$ respectively.

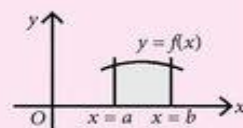
Properties

- $\int_a^b f(x) dx = \int_a^b f(t) dt$
- $\int_a^b f(x) dx = -\int_b^a f(x) dx$. In particular $\int_a^a f(x) dx = 0$
- $\int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$ where $a < c < b$
- $\int_a^b f(x) dx = \int_a^b f(a+b-x) dx$ • $\int_0^a f(x) dx = \int_0^a f(a-x) dx$
- $\int_{-a}^a f(x) dx = \begin{cases} 0 & , \text{ if } f(-x) = -f(x) \\ 2 \int_0^a f(x) dx & , \text{ if } f(-x) = f(x) \end{cases}$
- $\int_0^{2a} f(x) dx = \int_0^a f(x) dx + \int_0^a f(2a-x) dx$
- $\int_0^{2a} f(x) dx = \begin{cases} 2 \int_0^a f(x) dx & , \text{ if } f(2a-x) = f(x) \\ 0 & , \text{ if } f(2a-x) = -f(x) \end{cases}$

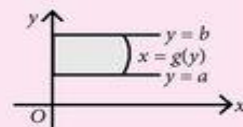
APPLICATION OF INTEGRALS

Area Under Simple Curves

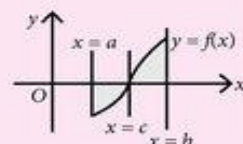
• Area $= \int_a^b y dx$
 $= \int_a^b f(x) dx$ (where $b > a$)



• Area $= \int_a^b x dy$
 $= \int_a^b g(y) dy$ (where $b > a$)

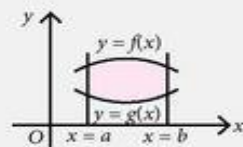


• Area $= \left| \int_a^c f(x) dx \right| + \int_c^b f(x) dx$

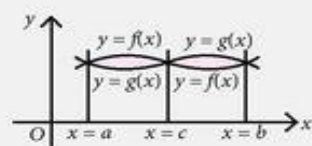


Area Between Two Curves

• Area $= \int_a^b [f(x) - g(x)] dx$,
 $f(x) \geq g(x)$ in $[a, b]$

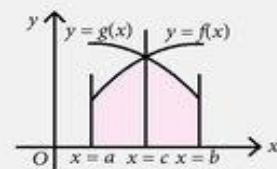


• Area $= \int_a^c [f(x) - g(x)] dx$
 $+ \int_c^b [g(x) - f(x)] dx$



where $f(x) \geq g(x)$ in $[a, c]$ and $f(x) \leq g(x)$ in $[c, b]$

• Area $= \int_a^c f(x) dx + \int_c^b g(x) dx$





SCIENCE TOPIC OF THE MONTH:



**Class
XII**

STEREOCHEMISTRY

Stereochemistry is a unique part of chemistry concerned with the study of the spatial arrangement of atoms and molecules in the compound, its effect on chemical reaction and relations to the properties of compounds. It is also known as 3D chemistry. Different enantiomers have different selectivity for biological targets and have different biological actions. Hence, stereochemistry has great importance in pharmaceutical industry.

**CONCEPT
MAP**

Stereoisomers

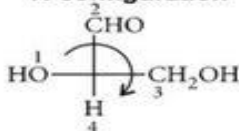
The isomers that are different from each other only in the way the atoms are oriented in space are called *stereoisomers*.

Absolute Configuration (*R* and *S* system of nomenclature)

In order to designate absolute configurations a system of nomenclature called *Cahn-Ingold-Prelog* system has been developed.

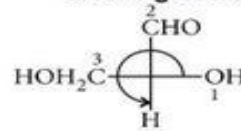
- Assign priority to the groups attached. Higher atomic number will get higher priority.
- The H atom or group of lowest priority is brought vertically in Fischer projection.

R-configuration



Move the arrow in order of decreasing priority. If it rotates clockwise, configuration is *R* (*rectus*) configuration.

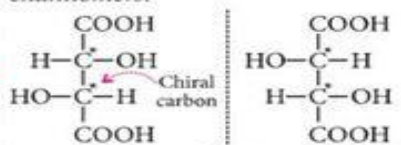
S-configuration



Move the arrow in order of decreasing priority. If it rotates anti-clockwise, then the configuration is *S* (*sinister*) configuration.

Enantiomers

Stereoisomers having non super-imposable mirror images are optically active and these are called *enantiomers*.



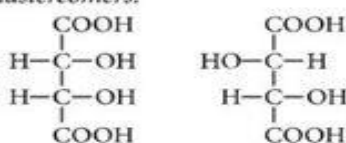
(dextrorotatory)
d-enantiomer
Rotates the plane
polarised light
towards right.

Mirror

(laevorotatory)
l-enantiomer
Rotates the plane
polarised light
towards left.

Diastereomers

Stereoisomers that are not mirror images of each other are called *diastereomers*.



Number of stereoisomers

The number of stereoisomers depends on structure and number of asymmetric carbon atoms present in the molecule.

In unsymmetrical molecule

Number of enantiomers = 2^n

Meso forms = 0

Total optical isomers = 2^n

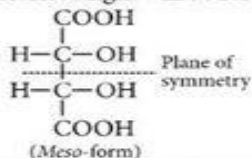
where, n = number of chiral or asymmetric carbon atoms.

In symmetrical molecule

- When n is odd,
Number of enantiomers = $2^{(n-1)}$
Meso forms = $2^{(0.5n - 0.5)}$
Total optical isomers = $2^{(n-1)}$
- When n is even,
Number of enantiomers = $2^{(n-1)}$
Meso forms = $2^{(n/2 - 1)}$
Total optical isomers = $2^{(n-1)} + 2^{(n/2 - 1)}$

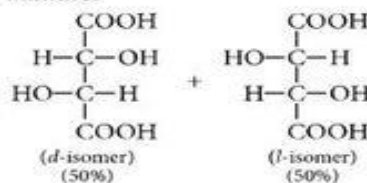
Meso form

If plane of symmetry is present in the molecule then, one of the isomer will be optically inactive due to internal compensation because half of the molecule will rotate the plane polarised light towards right and another half towards left. So, total rotation of plane polarised light will be zero.



Racemic mixture

If both *d* and *l* enantiomers present in equal amount (50-50%) then the mixture is optically inactive due to external compensation, the mixture is known as *racemic mixture*.



Resolution of racemic mixture

The process of separation of a racemic mixture into *d*- and *l*-forms is called *resolution*.

Following are the methods by which a racemic mixture can be resolved:

- Mechanical separation
- Biochemical separation
- Chemical separation
- Chromatographic method
- Selective adsorption method

Racemisation

Conversion of (+) or (−) isomer into its racemic mixture (±) is known as *racemisation*. It is reverse of resolution and can be carried out either by heat, light or use of chemical reagents, etc.



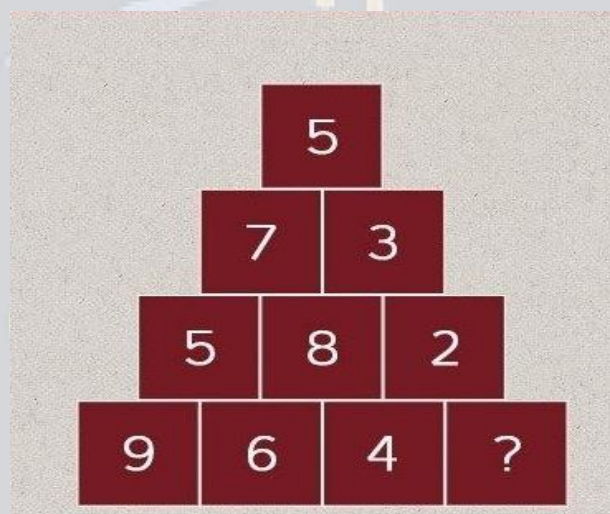
TWIST YOUR MIND

(Answers will be given in the February 2025 digest)

RIDDLES

1. What can't be put in a saucepan ?
2. If you're running in a race and you pass the person in second place, what place are you in ?
3. It belongs to you, but other people use it more than you do. What is it?

PUZZLE



Bright Spots: Positive Events from DECEMBER 2024

- **EU Emissions Decline:** The European Union reported an 8% drop in greenhouse gas emissions for 2023, reaching 37% below 1990 levels.
- **Norway's EV Milestone:** Norway became the first country where electric vehicles outnumbered petrol cars.
- **Malaria Vaccine Rollout:** Cameroon initiated routine vaccinations against malaria, with 17 African countries now offering the RTS,S vaccine to children.
- **Medical Debt Relief in the US:** Arizona announced plans to wipe medical debt for up to one million residents as part of a government initiative.
- **New Alzheimer's Drug Approved:** The FDA approved Donanemab, a new treatment aimed at slowing cognitive decline in early Alzheimer's patients.
- **India's Semiconductor Unit:** India approved its first semiconductor fabrication unit in Dholera, Gujarat, enhancing its tech industry.

**word
of the
month**

Alma mater : The university , college or school that one formerly attended

DECEMBER ANSWERS

RIDDLES : 1.Book 2. A Dictionary

PUZZLE : 6



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JUNE 2023



JULY 2023







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Affordable Quality education

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