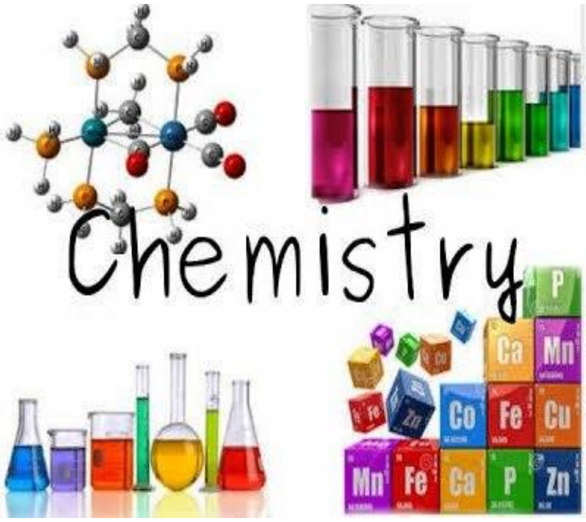

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CHEMFLASH

THE CHEMISTRY NEWS LETTER

EASWARI ENGINEERING COLLEGE

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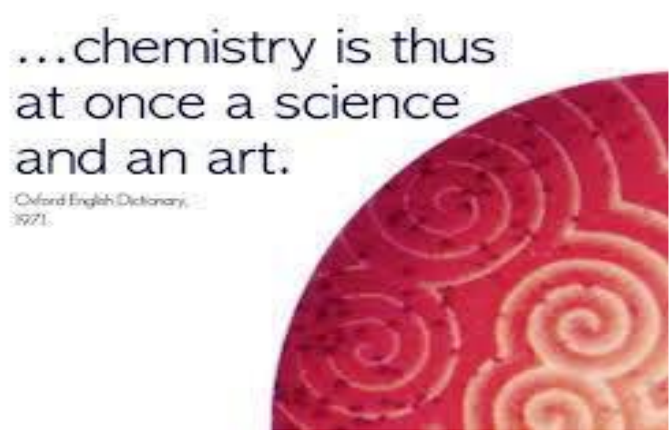


MESSAGE FROM THE HOD'S DESK

Dr. C. Ravichandran
Professor and Head

The department of chemistry has brought out its quarterly newsletter **chemflash**. Its focus is on all the recent happenings in the field of chemistry. This news letter is sure to give a suitable platform to all the budding engineers to widen their perspective. I express my heartiest congratulations to all the staff and students who were behind the success of chemflash.

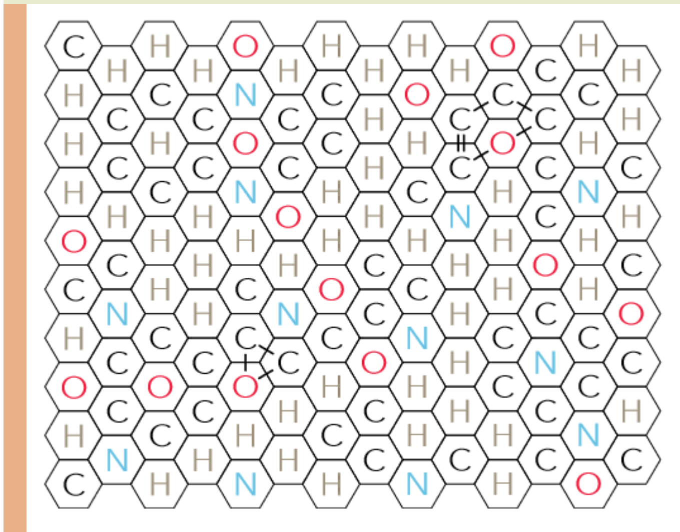
I seek their continued co-operation in all the future endeavors.

Dr. C. Ravichandran

"Hot glassware looks the same as cold glassware"

Chemistry puts the "Cation" in education

Puzzles

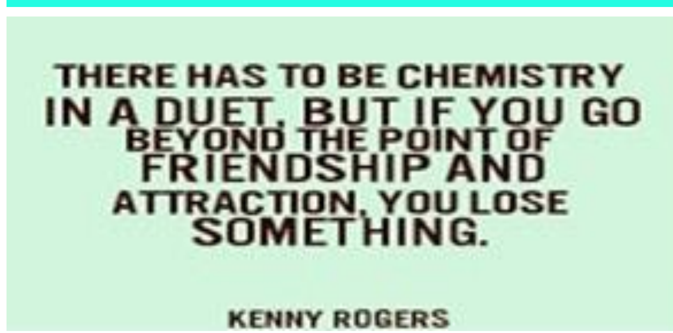


Molecule Search

Connect atoms in adjacent cells using single or multiple bonds to reveal the hiddenmolecules. The hexagonal grid necessitates some minor distortion of bond angles – forexample the five-membered ring drawn in as a starting point.
Find these four molecules – we've already started two of them for you.

1. $C_{12}H_{14}O$
2. $C_9H_{14}N_2$
3. $C_8H_8O_3$
4. $C_6H_8O_3$

<u>CLUES</u>: The molecules include one ester, one aldehyde and one ketone. Two include alcohols.
Three contain heterocycles – but those rings are not all aromatic.



ARTICLES

The unbelievable speed of electron emission from an atom

In a unique experiment, researchers have clocked how long it takes for an electron to be emitted from an atom. The result is 0.00000000000000002 seconds, or 20 billionths of a billionth of a second. The researchers' stopwatch consists of extremely short laser pulses. Hopefully, the results will help to provide new insights into some of the most fundamental processes in nature.

Cool microscope technology revolutionises biochemistry

A picture is a key to understanding. Scientific breakthroughs often build upon the successful visualisation of objects invisible to the human eye. However, biochemical maps have long been filled with blank spaces because the available technology has had difficulty generating images of much of life's molecular machinery. Cryo-electron microscopy changes all of this. Researchers can now freeze biomolecules mid-movement and visualise processes they have never previously seen, which is decisive for both the basic understanding of life's chemistry and for the development of pharmaceuticals.

Electron microscopes were long believed to only be suitable for imaging dead matter, because the powerful electron beam destroys biological material. But in 1990, Richard Henderson succeeded in using an electron microscope to generate a three-dimensional image of a protein at atomic resolution. This breakthrough proved the technology's potential.

Joachim Frank made the technology generally applicable. Between 1975 and 1986 he developed an image processing method in which the electron microscope's fuzzy two dimensional images are analysed and merged to reveal a sharp three-dimensional structure.

Jacques Dubochet added water to electron microscopy. Liquid water evaporates in the electron microscope's vacuum, which makes the biomolecules collapse. In the early 1980s, Dubochet succeeded in vitrifying water – he cooled water so rapidly that it solidified in its liquid form around a biological sample, allowing the biomolecules to retain their natural shape even in a vacuum.

Following these discoveries, the electron microscope's every nut and bolts have been optimised. The desired atomic resolution was reached in 2013, and researchers can now routinely produce three-dimensional structures of biomolecules. In the past few years, scientific literature has been filled with images of everything from proteins that cause antibiotic resistance, to the surface of the Zika virus. Biochemistry is now facing an explosive development and is all set for an exciting future.

B.AKASH HARI
I EEE-A

Scientific facts on chemistry

- Phosphorus is essential to living organisms. There are about 750 grams of phosphorus in the average adult. In the human body, it's found in DNA, bones, and as an ion used for muscle contraction and nerve conduction. Pure phosphorus, however, can be deadly. White phosphorus, in particular, is associated with negative health effects. When matches were made using white phosphorus, a disease known as phossy jaw caused disfiguration and death. Contact with white phosphorus can cause chemical burns. Red phosphorus is a safer alternative and is considered non-toxic.
- Magnesium is an important alkaline earth metal that is essential for animal and plant nutrition.

The element in found in foods we eat and many everyday products.Magnesium is needed for hundreds of biochemical reactions in the body. The average person needs 250-350 mg of magnesium each day or about 100 grams of magnesium per year. Almost 60% of the magnesium in the human body is found in the skeleton, 39% in the muscle tissue, and 1% is extracellular.

- Every hydrogen atom in your body is likely to be 13.5 billion years old, since they were created at the birth of the universe.At ground zero, during the Universe's singularity, the very first chemical element was hydrogen. All the other followed by fusing hydrogen into helium, which then fused into carbon and so on. Approximately 73% of the mass of the visible universe is in the form of hydrogen. Helium makes up about 25% of the mass, and everything else represents only 2%. By mass, hydrogen and helium combined make up far less than 1% of the Earth.

- The rarest naturally-occurring element in the earth's crust may be astatine. Named after the Greek word for unstable (*astatos*), Astatine is a naturally occurring semi-metal that results from the decay of uranium and thorium. In its most stable form, the element has a half-time of only 8.1 hours. The entire crust appears to contain about 28 g of the element. If scientists ever have to use it, they basically have to make it from scratch. Only 0.00000005 grams of astatine have been made so far.

- The element is essential for animal and plant nutrition. Calcium participates in many biochemical reactions, including building skeletal systems, cell signaling, and moderating muscle action. It is the most abundant metal in the human body, found mainly in bones and teeth. If you could extract all of the calcium from the average adult person, you'd have about 2 pounds (1 kilogram) of the metal. Calcium in the form of calcium carbonate is used by snails and shellfish to construct shells.

- Tritium can exist as an odorless and colorless gas, like ordinary hydrogen, but the element is mainly found in liquid form as part of tritiated water or T_2O, a form of heavy water. External exposure to tritium gas or tritiated water is not very dangerous because tritium emits such a low energy beta particle that the radiation cannot penetrate skin. Tritium has many uses, including self-powered lighting, as a component in nuclear weapons, as a radioactive label in chemistry lab work, as a tracer for biological and environmental studies, and for controlled nuclear fusion.

P.Divya Sai Sudha
I EEE A

A Step Closer to Artificial Photosynthesis

Semi-finalists in the **NRG COSIA Carbon XPRIZE**, a $20 million challenge to **"Develop breakthrough technologies that will convert CO emissions from power plants and industrial facilities into valuable products."**

The project was the result of an international and multidisciplinary collaboration. The **Canadian Light Source** in Saskatchewan provided the high-energy x-rays used to probe the electronic properties of the catalyst. **The Molecular Foundry** at the **U.S. Department of Energy's Lawrence Berkeley National Laboratory** did theoretical modelling work. Financial and in-kind support were provided by the **Natural Sciences and Engineering Research Council**, **the Canada Foundation for Innovation**, **Tianjin University**,**Fudan University and the Beijing Light Source**.

As for what has kept him motivated throughout the project, De Luna points to **the opportunity to make an impact on some of society's biggest environmental challenges**.

"Seeing the rapid advancement within the field has been extremely exciting," he says. "At every weekly or monthly conference that we have within our lab, people are smashing records left and right. There is still a lot of room to grow, but I genuinely enjoy the research, and carbon emissions are such a big deal that any improvement feels like a real accomplishment."

Prepared By:	**Approved By:**
Dr. M. Kumar	**HOD/Chemistry**