

INDIAN INSTITUTE OF TECHNOLOGY PATNA



THC TRIBUNE

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ON BEHALF OF THRESHOLD CLUB

DIVYANSHU KHANDELWAL

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ALL AROUND THE WORLD

RECENT WORKS BY SCIENTISTS!!

Matters of the heart: Researchers create 3-D beating heart

Matters of the heart can be complicated, but scientists have now found a way to create 3-D heart tissue that beats in synchronized harmony, like a heart in love, that will lead to better understanding of cardiac health and improved treatments. Researchers have devised a way to stick three different types of cardiac cells together, like Velcro, to make heart tissue that beats as one.

Link : <https://www.sciencedaily.com/releases/2017/02/170209163826.htm>

Bacteria fed synthetic iron-containing molecules turn into electrical generators

The bacterial world is rife with unusual talents, among them a knack for producing electricity. In the wild, 'electrogenic' bacteria generate current as part of their metabolism, and now researchers have found a way to confer that ability upon non-electrogenic bacteria. This technique could have applications for sustainable electricity generation and wastewater treatment.

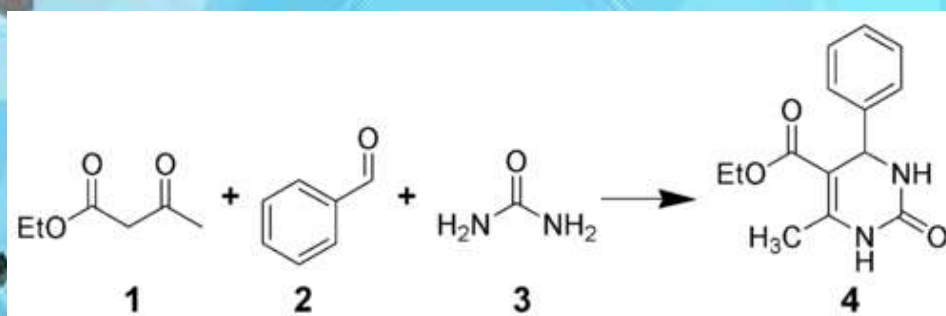
Link :

<https://www.sciencedaily.com/releases/2017/02/170209133509.htm>

Learning zone

REACTION YOU MUST KNOW

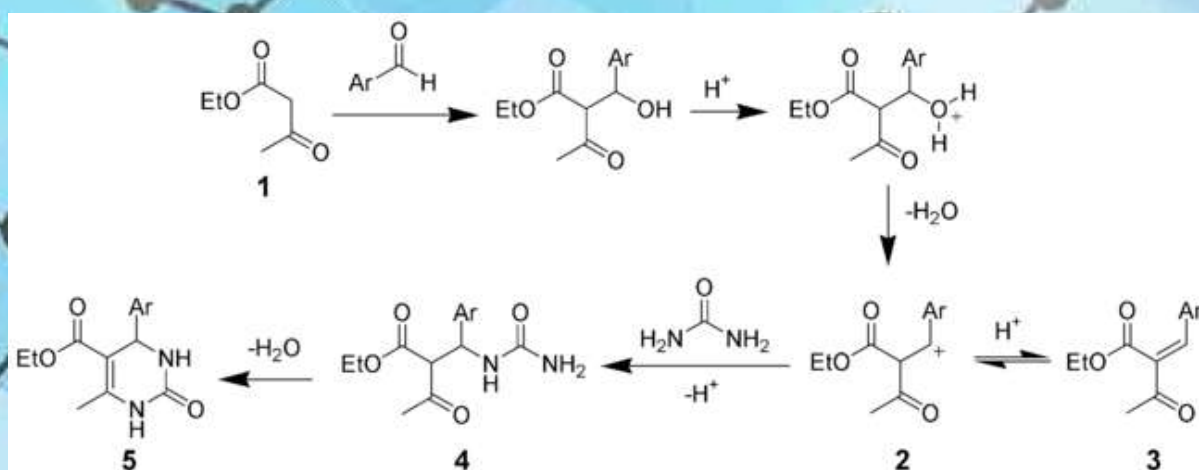
The **Biginelli reaction** is a multiple-component chemical reaction that creates 3,4-dihydropyrimidin-2(1*H*)-ones **4** from ethyl acetoacetate **1**, an aryl aldehyde (such as benzaldehyde **2**), and urea **3**. It is named for the Italian chemist Pietro Biginelli.



Reaction Mechanism :

The reaction mechanism of the Biginelli reaction is a series of bimolecular reactions leading to the desired dihydropyrimidinone.

According to a mechanism proposed by Sweet in 1973 the aldol condensation of ethylacetoacetate **1** and the aryl aldehyde is the rate-limiting step leading to the carbenium ion **2**. The nucleophilic addition of urea gives the intermediate **4**, which quickly dehydrates to give the desired product **5**.



INFORMATION ZONE

DRDO

The **Defence Research and Development Organisation (DRDO)** is an agency of the Republic of India, charged with the military's research and development, headquartered in New Delhi, India. It was formed in 1958 by the merger of the Technical Development Establishment and the Directorate of Technical Development and Production with the Defence Science Organisation. It is under the administrative control of the Ministry of Defence, Government of India.

With a network of 52 laboratories, which are engaged in developing defence technologies covering various fields, like aeronautics, armaments, electronics, land combat engineering, life sciences, materials, missiles, and naval systems, DRDO is India's largest and most diverse research organisation. The organisation includes around 5,000 scientists belonging to the Defence Research & Development Service (DRDS) and about 25,000 other scientific, technical and supporting personnel.

Defense Research & Development Organization (DRDO) works under Department of Defense Research and Development of Ministry of Defense. DRDO every year conducts a Scientist Entry Test (SET) on all India basis for the recruitment of scientists 'B' posts. A huge number of candidates appear for DRDO SET test.

DRDO SET **is conducted on all India basis in the month of September**, depending on the requirements, in order to provide equal opportunity to all students from different educational institutions in view of the increasingly wide variation in the marking pattern of different educational institutions in the country.

Important Date:The advertisement generally appears during the month of April / May every year.

DRDO SET Exam Eligibility Criteria and Application Form

Candidates having first class bachelor degree (minimum 60 % marks) in engineering, technology, electronics, communication, mechanical engineering and computer science can apply for SET exam.

Age Limit for DRDO SET Exam is 28 years and You must be a citizen of India to apply.

Application forms are available with information brochure at designated branches of State Bank of India or forms are also published on the official website. General/OBC candidates on payment of Rs. 300/- (Rs. 100/- for the application form with information brochure and Rs. 200/- as Exam. Fees). For SC/ST candidates, there is no exam fee and the application form with information brochure will be available to them on payment of Rs. 100/- only.

DRDO SET Exam Pattern

DRDO SET exam consists of two stages –Written test followed by Interview. Marks you score in DRDO SET Written test is not carried forward but is just used for screening candidates for Interview. Final selection is based on the performance in the interview only.

DRDO SET Written test is 3-hour long with two sections:

Section A: Subject Knowledge (BE/ BTech (for Engg discipline) or MSc (for Science Discipline))

Section B: Aptitude for Applied Research & Development.

Recruitment Through Gate

1 : Only Indian nationals need apply

2: Candidates must have obtained atleast a first class in their qualifying exam equivalent to 60%. In case of non-availability of the conversion formula, CGPA/CPI of 6.75 (for a 10 point scale) will be taken as equivalent to 60%,

3 :As per AICTE guidelines. For any other point scale of CGPA/CPI, the equivalence may vary proportionally.

4: Knowledge of German, French, Russian, Japanese or Chinese is desirable but not mandatory

5 : The upper age limit not exceeding 28 years. Relaxation will be as per Govt guidelines

Chemistry	At least First Class Master's Degree in Chemistry from a recognized University or equivalent.	Chemistry (CY)	1. Chemistry 2. Organic Chemistry 3. Inorganic Chemistry 4. Analytical Chemistry 5. Physical Chemistry
Chemical Engg	At least First Class Bachelor's Degree in Engineering or Technology in Chemical Engg from a recognized university or equivalent.	Chemical Engineering (CH)	1. Chemical Engg 2. Chemical Engg / Chemical Tech 3. Chemical Plant Engg 4. App. Chemical and Polymer Tech 5. Polymer Science & Chemical Technology

FUN ZONE

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CHEMISTRY WORDSEARCH

Name: _____ Date: _____ Class Period: _____

Chemistry Lab Word Search I

CLTJNARDQQJLCSLRPKITSFLZU
JIIIBETNEMELECDAQYSVVWAWZX
HWKTNWZTSXDLHAHADAOALEUGRW
ZGPRMGNURDYMALASMLTUKMRGP
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NVRKTSEPOHOKWTDXYDPPWQEEU
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UMDCRCOPPERVKOJERLRAQZ IOT
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AAKJQB YDKRSJJHSFPRBUCAGLN

ACID
BURNER
COPPER
EXPERIMENT
HYDROMETER
POTASSIUM
SOLUTION

BEAKER
CHEMICAL
ELECTRODE
GAS
LITMUS PAPER
SCALE
SULFUR

BUNSEN
CHLORINE
ELEMENT
GOGGLES
MICROSCOPE
SLIDE
THERMOMETER

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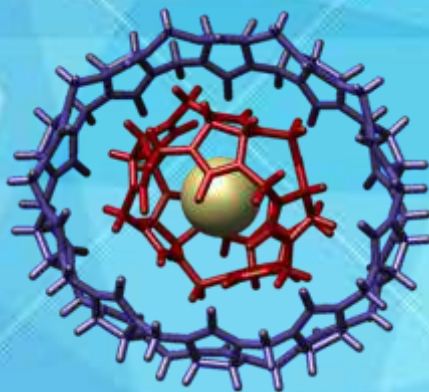
www.studenthandouts.com

NOTE: Words can be from upward to downward(vice-versa), left to right(vice-versa) and diagonally.

EXPLORE ZONE

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SUPRAMOLECULAR CHEMISTRY



Supramolecular chemistry is the domain of chemistry beyond that of molecules and focuses on the chemical systems made up of a discrete number of assembled molecular subunits or components. The forces responsible for the spatial organization may vary from weak (intermolecular forces, electrostatic or hydrogen bonding) to strong (covalent bonding), provided that the degree of electronic coupling between the molecular component remains small with respect to relevant energy parameters of the component. While traditional chemistry focuses on the covalent bond, supramolecular chemistry examines the weaker and reversible noncovalent interactions between molecules. These forces include hydrogen bonding, metal coordination, hydrophobic forces, van der Waals forces, pi-pi interactions and electrostatic effects. Important concepts that have been demonstrated by supramolecular chemistry include molecular self-assembly, folding, molecular recognition, host-guest chemistry, mechanically-interlocked molecular architectures, and dynamic covalent chemistry. The study of non-covalent interactions is crucial to understanding many biological processes from cell structure to vision that rely on these forces for structure and function. Biological systems are often the inspiration for supramolecular research.

CHEMISTRY IN EVERYDAY LIFE

NOW YOU SEE IT, NOW YOU DON'T

If your father is a diplomat you might have noticed him scribbling on a note with a pen that didn't seem to have any ink in it. Though invisible ink is something you read in stories it really does exist. Here's how it works.

Making invisible ink

There are many ways of making invisible ink. The art of writing secret messages in this way is called steganography. Here are three ways of making and using invisible inks.

Organic substances

Write your message on a piece of paper with milk, lemon juice or vinegar, and let it dry completely. Your message becomes invisible. Now write a different message in ordinary ink over the original message and pass it to your secret friend. Even if enemies intercept the message, they can only see the harmless message in ordinary ink. When your friend gets it, he will have to hold the message over a candle or a hot light bulb (but not too close). The secret message will slowly reappear.

Milk, lemon juice and vinegar are organic substances. When heated, organic substances begin to burn, leaving behind brown or black soot. The paper does not burn as it needs a higher temperature than lemon juice or vinegar. But remember not to heat it too much.

Acid-base indicators

Chemicals like thymolphthalein and phenolphthalein change their colour depending on whether they are in an acidic or basic (alkaline) environment, and are therefore called acid-base indicators (ABI). Thymolphthalein is blue in an alkaline solution, but becomes colourless in an acidic environment.

Phenolphthalein is pink in alkali and colourless in acid solutions.

Try this experiment in school. With your teacher's help, prepare a solution of ABI in water, and add a drop of caustic soda (sodium hydroxide) to make it alkaline. With this, now write your secret message on a piece of paper and let it dry in air. The caustic soda will react with carbon dioxide in the air, and the solution will slowly become neutral. As that happens, the colour will fade away, and your name will disappear!

To make it reappear, brush the paper with a mild solution of sodium hydroxide. It will make it alkaline again, and your message will reappear.

Writing on eggs

Make a mixture of alum (potassium aluminium sulphate) and vinegar. Dip a brush into this, and write your message on an intact egg. Wait till the solution dries completely, and hand the egg to your friend.

How will she read the message? By boiling the egg! When she peels away the shell, she can see your message on the white of the boiled egg.

The alum reacts with the vinegar to form a coloured substance, which penetrates the porous eggshell, but cannot pass the egg membrane and stays stuck there.

NOBEL LAUREATES IN CHEMISTRY

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ROBERT J. LEFKOWITZ AND BRIAN K. KOBILKA (2012)



Robert J. Lefkowitz



Brian K. Kobilka

The Nobel Prize in Chemistry 2012 was awarded jointly to Robert J. Lefkowitz and Brian K. Kobilka "for studies of G-protein-coupled receptors"

Your body is a fine-tuned system of interactions between billions of cells. Each cell has tiny receptors that enable it to sense its environment, so it can adapt to new situations. **Robert Lefkowitz** and **Brian Kobilka** are awarded the 2012 Nobel Prize in Chemistry for groundbreaking discoveries that reveal the inner workings of an important family of such receptors: G-protein-coupled receptors.

For a long time, it remained a mystery how cells could sense their environment. Scientists knew that hormones such as adrenalin had powerful effects: increasing blood pressure and making the heart beat faster. They suspected that cell surfaces contained some kind of recipient for hormones. But what these receptors actually consisted of and how they worked remained obscured for most of the 20th Century.

Lefkowitz started to use radioactivity in 1968 in order to trace cells' receptors. He attached an iodine isotope to various hormones, and thanks to the radiation, he managed to unveil several receptors, among those a receptor for adrenalin: β -adrenergic receptor. His team of researchers extracted the

receptor from its hiding place in the cell wall and gained an initial understanding of how it works.

The team achieved its next big step during the 1980s. The newly recruited Kobilka accepted the challenge to isolate the gene that codes for the β -adrenergic receptor from the gigantic human genome. His creative approach allowed him to attain his goal. When the researchers analyzed the gene, they discovered that the receptor was similar to one in the eye that captures light. They realized that there is a whole family of receptors that look alike and function in the same manner.

Today this family is referred to as G-protein-coupled receptors. About a thousand genes code for such receptors, for example, for light, flavour, odour, adrenalin, histamine, dopamine and serotonin. About half of all medications achieve their effect through G-protein-coupled receptors.

The studies by Lefkowitz and Kobilka are crucial for understanding how G-protein-coupled receptors function. Furthermore, in 2011, Kobilka achieved another break-through; he and his research team captured an image of the β -adrenergic receptor at the exact moment that it is activated by a hormone and sends a signal into the cell. This image is a molecular masterpiece – the result of decades of research.

Molecular diversity from the three-component reaction of 2-hydroxy-1,4-naphthaquinone, aldehydes and 6-aminouracils: a reaction condition dependent MCR



This is one of the research work of Associate Professor Lokman Choudhary along with research scholars Ruchi Bharti, Tasneem Parvin and Pooja Kumari.

Abstract

The three-component reaction of 2-hydroxy-1,4-naphthaquinone, aldehydes, and 6-aminouracil derivatives in acetic acid/water (1 : 1; v/v) under microwave heating conditions provides 1,4-dihydropyridines fused with naphthaquinone and pyrimidines. On the other hand the same reaction combinations under conventional reflux conditions provide acyclic trisubstituted methane derivatives. Using these tuneable reaction conditions a series of polycyclic fused N-heterocycles has been synthesized. The notable features of this methodology are a simple metal-free one-pot operation, easy purification process, use of the green solvent water, short reaction time and good to moderate yields of the products.

Introduction

One-pot multicomponent reactions (MCRs) have emerged as an efficient tool for benign synthesis of functionalized heterocycles by virtue of their convergence, productivity, facile execution, and generation of highly diverse and complex products from easily available starting materials in a single

operation. MCRs are very useful to access privileged medicinal scaffold especially, for synthesizing various N-heterocyclic compounds which are key constituents of a wide range of both natural and synthetic bioactive compounds. Microwave assisted multi-component reactions have drawn remarkable attention from organic and medicinal chemists considering their green features. MW irradiation provides enhanced reaction rates, higher yields of products, better selectivity, rapid optimization of reactions and several ecofriendly advantages. Further, in comparison with organic solvents, water is a non-toxic, non-corrosive, non-explosive and is readily available solvent. These properties along with the network of hydrogen bonds, large surface tension, high polarity and high specific heat capacity make it both economical and environmentally friendly and thus suitable as a green solvent. According to the current synthetic requirements and from green perspective, environmentally benign multicomponent procedures employing microwave methodology in aqueous medium are particularly welcome.

Polycyclic fused N-heterocycles have attracted much attention due to their presence in biologically active natural products and pharmaceuticals. They display a wide range of biological activities such as antifungal, antibacterial, antineoplastic, anti-cancer, antiplasmodial, and as DNA intercalators. The presence of several functional groups in one molecule often proves useful to better bioactivities of compounds. Further, literature survey shows that fused polycyclic N-heterocycles containing naphthaquinone, 1,4-dihydro pyridine .And pyrimidine moieties are important in discovering new bioactive compounds due to their fascinating molecular structure and remarkable pharmacological efficiency

Molecular diversity from the three-component reaction of 2-hydroxy-1,4-naphthaquinone, aldehydes and 6-aminouracils: a reaction condition dependent MCR. Available from:

<https://www.researchgate.net/publication/312128367> Molecular diversity from the three-component reaction of 2-hydroxy-1,4-naphthaquinone aldehydes and 6-aminouracils a reaction condition dependent MCR

Welcome back folks. Here we are with one more interview session and this time Mr. ANKIT CHAHAL (Pre final year) shared with us his whole internship journey .

ThC: Please tell us a little about the industry where you were enrolled as intern.

Ankit : I did my intern in GHCL(Gujarat Heavy Chemicals Limited). In Chemicals, the company mainly manufactures Soda Ash (Anhydrous Sodium Carbonate) that is a major raw material for Detergents & Glass industries and it also manufacture Sodium Bicarbonate (baking soda).It's daily soda ash production is 2200MT/day. They have a small plant for sodium Bicarbonate with daily production 80Mt/Day. The technical data for the process is provided by Akzo-Zout Chemie BV, Netherlands. Now Company is expanding their plant to increase the production of Sodium Carbonate and Sodium Bi-Carbonate with the same parameters as provided by the Akzo-Zout Chemie BV, Netherlands.

ThC: What was the work given to you by them? How did you managed to complete it?

Ankit : For the first 2 week, I read about the process and the process parameters which they followed. After that they assigned us sodium bicarbonate plant's problems to work on the following problem statement:
"Utilization of waste liquor from Sodium Bicarbonate plant".

Now I can write a book on how I managed to complete the process. But I'll try and keep it short. I'll briefly describe the process:

Process : Waste liquor from sodium Bicarbonate plant contain saturated solution containing sodium carbonate and sodium bicarbonate. After that this liquid is sent to Stripping Column. This column consist of a section of packing and trays. Steam is injecting in this column from bottom to heat up the solution. On heating sodium bicarbonate get converted into the sodium carbonate. After that, mix the dry sodium carbonate to the resulting stream to make the solution saturated. This stream is used again to produce sodium Bicarbonate

Problem : Due to steam condensation, less efficiency of stripping column and the storage capacity, the amount of waste liquor increase. So every day a part of the liquor is purge to brine purification section. Due to that their daily production of sodium carbonate decrease.

Solution : 1)Reducing the flush water by increasing storage capacity.
2)Increasing the feed rate and height of stripping tower to maintain the efficiency of the tower. Dissolve solid salt (NaCl) in excess solution and then purge to Brine purification section. That will increase the chloride concentration in main stream.
This was the solution that we came up with for this particular problem. Testing for the solutions also proved us right.

ThC : How is an industrial intern different from that of the research one?

Ankit : According to my perspective,

a)Industrial Intern : By doing an industrial internship, you gain knowledge about a particular industrial process they follow to manufacture particular products.

In a company if you are doing research intern, either you are developing a product or optimizing the process to increase the process efficiency by which company will get benefits and you get stipend.

b)Research Intern :If you are doing a research internship under a professor, you will be more concerned about theoretical aspect of the subject rather than practical applications. It would be beneficial to do a research internship in case you are planning to pursue higher studies after B.tech.

Meanwhile doing a consultancy projects(projects given to professors by companies or by interdisciplinary collaboration) under a professors will give you an industrial glance of the field as well.

ThC: How did you approached the company for internship? What were the diggings you did about the companies while applying?

Ankit: I approached the company through LinkedIn. Initially I made a list of industries and companies that were giving services in my field of interest. I started out by categorizing the companies based on their working environment and better experiences of past interns. I started sending requests to HR of those companies. A telephonic interview was done and I was later intimated of my selection through a mail. I then carried out rest of the process through telephonic and email conversations with the HR of that company.

ThC : Did the internship helped you in learning? If yes, in what ways?

Ankit : The word internship itself means undergoing realtime experience in the realtime working scenarios of the industries. Apart from gaining knowledge about production of soda ash, I got to learn a lot about the working culture in the industries. It made me more ready for the cruel world out of the gates of our comforting college.

ThC : "Internship with good stipend"- always a difficult one, but you nailed it.What's the secret behind it?

Ankit : I think there's no secret behind success. In my belief, the only thing that matters is the hard work that you put in. We are living in a materialistic world and the Stipend and added benefits are just 'mohmaaya'. If you are putting in the required efforts, the success is not far away and in my view, money should not be a criteria to rank or rate success. The only thing which matters is you should enjoy what you are doing.

ThC : Some suggestions for your 'beloved' juniors.

Ankit : I would like to suggest you all to start exploring your area of interests and finding out your interest and start working in that particular field so as to get experience and knowledge in that field which is gonna help you in the future. This is the time to choose your path. Be focused and Think clear, and always be confident on your decisions.

ThC : Thanks for your time and we wish you all the best for future.