THC TRIBUNE VOL : 2

ALL AROUND THE WORLD

First ever iron–bismuth binary compound

Scientists in the US have synthesised the first ever iron–bismuth binary compound. The team, led by Danna Freedman of Northwestern University in Illinois, says that compounds like these could be key as they attempt to create new magnetic and superconducting materials.

Link: https://www.chemistryworld.com/news/first-ever-ironbismuth-binary-compound/1017607.article

Solar cell produces electricity come rain or shine

Illuminated under the midday sun, solar cells can quickly convert sunlight into electricity, but their performance often drops as the clouds begin to gather. Now, scientists in China have made an 'all-weather' solar cell that can exploit both sunshine and rain.

Link: https://www.chemistryworld.com/news/solar-cell-produces-electricity-come-rain-or-shine/1017584.article

IR microscope exposes proteins in living cells

An infrared microscope that can image living cells in 3D has been made by scientists in the US. The tool can also probe deeper into cells to track the movement of individual proteins and even drug molecules.

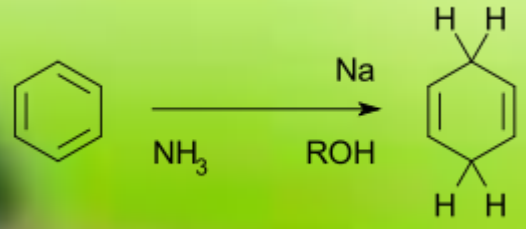
Link: https://www.chemistryworld.com/news/ir-microscope-exposes-proteins-in-living-cells/1017500.article

LEARNING ZONE

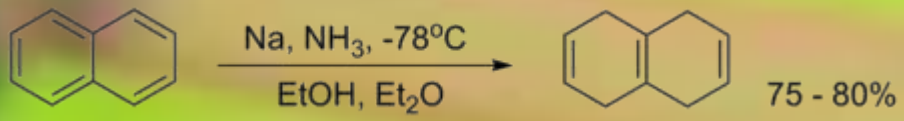
REACTION YOU MUST KNOW

BIRCH REDUCTION

The Birch reduction is an organic reaction which is particularly useful in synthetic organic chemistry. It converts aromatic compounds having a benzenoid ring into a product, 1,4-cyclohexadienes, in which two hydrogen atoms have been attached on opposite ends of the molecule. It is the organic reduction of aromatic rings in liquid ammonia with sodium, lithium or potassium and an alcohol, such as ethanol and tert-butanol. This reaction is quite unlike catalytic hydrogenation, which usually reduces the aromatic ring all the way to a cyclohexane.



An example is the reduction of napthalene:



INFORMATION ZONE

OIL & NATURAL GAS CORPORATION

Oil and Natural Gas Corporation Limited (ONGC) is an Indian multinational oil and gas company headquartered in Dehradun, Uttarakhand, India. It is a Public Sector Undertaking (PSU) of the Government of India, under the administrative control of the Ministry of Petroleum and Natural Gas. It is India's largest oil and gas exploration and production company. It produces around 77% of India's crude oil (equivalent to around 30% of the country's total demand) and around 62% of its natural gas.

Selection process: on the basis of GATE 2016 scores followed by a personal interview.

The weightage for a total of 100 marks will be as follows:
GATE-2016 Score 60 Marks
Interview 15 Marks
Academic Qualification 25 Marks (20 marks for essential qualification and upto 5 marks for inline higher qualifications)

Eligibility Criteria: Candidates must have passed their respective qualifying degree with a minimum of 60% marks in aggregate. Other Eligibility Criteria must be as per the specifications. Equivalent degrees and such will not be accepted and such candidates are not eligible to apply.

Age Limit:

Category	*(except Drill./Cementing)*	*For Drilling/Cementing*
Unreserved(General)	*30 years*	*28 years*
OBC	*33 years*	*31 years*
SC/ST	*35 years*	*33 years*
Persons with Disabilities	*40 years (further relaxed by 3yrs with Disabilities(PWD) for OBC and 5yrs for SC/ST)*	*Not Applicable*
Ex-servicemen	*35 years*	*33 years*

How to apply:

Candidates can only apply if they have the GATE 2016 Registration Number (available on the GATE 2016 Admit Card).Candidates must apply for only one post even if they are eligible for more.They must fill all the requisite details and submit the application.The Registration slip generated as well as the printout of the Application Form must be kept safe to be furnished during the interview. Candidates must enter the name as per the GATE 2016 Application Form

Other details will be published after they are announced in January 2016.

Emoluments: Candidates will be placed in the Pay scale Rs.24900-50,500 with an increment of 3% every year. Additional emoluments as per company guidelines will be applicable.

Website: http://www.ongcindia.com/

NOTE: This eligibility criteria and selection process is based on gate 2016.

FUN ZONE

CHEMISTRY WORDSEARCH

CHEMICAL ELEMENTS WORD SEARCH PUZZLE

Z	H	P	V	B	M	E	R	C	U	R	Y	X	G	A	D	A
L	M	L	L	C	D	N	O	L	R	R	N	P	D	W	Q	T
J	W	A	P	H	C	U	I	W	C	O	A	B	U	H	G	A
B	D	T	U	H	C	M	J	T	B	O	C	N	D	Z	X	A
B	H	I	Z	O	Y	P	V	R	R	I	P	X	I	V	W	G
M	V	N	W	Z	G	D	A	P	I	O	S	P	H	U	H	H
T	U	U	H	P	S	C	R	N	J	X	G	M	E	F	M	L
Q	I	M	K	M	Z	F	X	O	V	Y	R	E	U	R	M	V
M	D	P	R	B	A	P	S	C	G	G	O	Q	N	T	K	A
S	M	D	Y	D	A	G	T	I	O	E	D	J	B	C	H	N
G	A	N	P	R	U	W	N	U	T	N	N	K	B	Z	M	T
M	U	E	T	A	A	R	S	E	N	I	C	Z	Z	O	R	I
Q	B	R	O	M	I	N	E	H	S	G	O	I	Y	S	K	M
E	L	C	N	L	W	F	P	C	W	I	S	D	T	Q	B	O
P	O	T	A	S	S	I	U	M	N	A	U	T	I	R	K	N
C	O	B	A	L	T	I	T	A	N	I	U	M	E	N	R	Y
N	C	A	L	C	I	U	M	A	H	N	Q	J	I	N	E	F

ANTIMONY
ARSENIC
BISMUTH
BROMINE
CALCIUM
CARBON
COBALT
COPPER
HYDROGEN
IODINE
KRYPTON
MAGNESIUM
MERCURY
NITROGEN
OXYGEN
PLATINUM
POTASSIUM
TITANIUM
TUNGSTEN
URANIUM

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EXPLORE ZONE

ANALYTICAL CHEMISTRY

Analytical chemistry studies and uses instruments and methods used to separate, identify, and quantify matter. In practice separation, identification or quantification may constitute the entire analysis or be combined with another method. Separation isolates analytes. Qualitative analysis identifies analytes, while quantitative analysis determines the numerical amount or concentration. Analytical chemistry consists of classical, wet chemical methods and modern, instrumental methods. Classical qualitative methods use separations such as precipitation, extraction, and distillation. Identification may be based on differences in color, odour, melting point, boiling point, radioactivity or reactivity. Classical quantitative analysis uses mass or volume changes to quantify amount. Instrumental methods may be used to separate samples using chromatography, electrophoresis or field flow fractionation. Then qualitative and quantitative analysis can be performed, often with the same instrument and may use light interaction, heat interaction, electric fields or magnetic fields . Often the same instrument can separate, identify and quantify an analyte.

Analytical chemistry is also focused on improvements in experimental design, chemometrics, and the creation of new measurement tools. Analytical chemistry has broad applications to forensics, medicine, science and engineering.

LET'S TALK CHEMISTRY
CHEMISTRY IN EVERYDAY LIFE

Why coffee keeps you awake?

It is well-known that the effect of coffee on mood is related to its content in caffeine. But why caffeine has such a strong effect on us? Caffeine operates using the same mechanisms of amphetamines, cocaine, and heroin to stimulate the brain, though with milder effects. It manipulates the same channels as the other drugs, and that is one of the things that gives caffeine its addictive qualities.

There is a chemical in our brain called adenosine, that binds to certain receptors and slows down nerve cell activity when we are sleeping. To a nerve cell, caffeine looks like adenosine and it binds to the adenosine receptors. However, as it's not really adenosine, it doesn't slow down the cell's activity like adenosine would. So the cell cannot "see" adenosine anymore because caffeine has taken up all the receptors adenosine binds to. Then instead of slowing down because of the adenosine level, the cells speed up.

The pituitary gland sees all of this activity and thinks some sort of emergency must be occurring, so it releases hormones that tell the adrenal glands to produce adrenaline. Adrenaline is the "fight" hormone, and it makes your heart to beat faster, the breathing tubes to open up, the liver to release sugar into the bloodstream for extra energy and your muscles to tighten up, ready for action. Because of this, after consuming a big cup of coffee your muscles tense up, you feel excited and you can feel your heart beat increasing. Moreover, as amphetamines, caffeine also increases the levels of dopamine, which is associated with the pleasure system of the brain, providing feelings of enjoyment and reinforcement.

COLLEGE UPDATES

Heyy guyzz , we are here this time with a new section “COLLEGE UPDATES” in which we will be mentioning some of the events going on in the college. So, last week our institute has started a new activity “Institute Colloquium”. Lectures were given by some professors regarding nobel prize winners 2016. They majorly explained about the research work done by the prize winners. Here we are just giving some glimpse on what were the researches related to chemistry only.

1: JEAN PIERRE SAUVAGE, J. FRASER STODDART, BERNARD L FERINGA :

They have been awarded for designing and synthesis of Molecular machines which are thousand times thinner than hair strand.

Kicking off the field in the early 1980s, Jean-Pierre Sauvage found a very nifty way to create two interlocking rings - a so-called “catenane”. It was a crucial step - here you have a system that is linked, but its two rings are not locked in place, instead they can move.

Fraser Stoddard also developed an innovative new kind of system- a rotaxane. These large molecules look a bit like dumbbells, with a ring sitting around the middle. As with the catenane, this ring is not fixed - it can move along the length of the dumbbell and what’s more, this movement can be controlled. The discovery led to a suite of molecular devices, from molecular lifts to switches and even a “molecular muscle”.

Bernard Feringa pushed the concept in new directions, embracing the idea of molecular motors. As well as the nanocar , he has created but a whole range of molecular devices including a molecular gearbox.

Their work on molecular machines - nanoscale structures could find applications in areas ranging from drug delivery to smart materials and even artificial life.

2 : YOSHINORI OHSUMI

This year's Nobel Laureate discovered and elucidated mechanisms underlying autophagy*, a fundamental process for degrading and recycling cellular components.*

The word autophagy *originates from the Greek words* auto-*, meaning "self", and* phagein*, meaning "to eat". Thus,autophagy denotes "self eating". This concept emerged during the 1960's, when researchers first observed that the cell could destroy its own contents by enclosing it in membranes, forming sack-like vesicles that were transported to a recycling compartment, called the* lysosome*, for degradation. Difficulties in studying the phenomenon meant that little was known until, in a series of brilliant experiments in the early 1990's, Yoshinori Ohsumi used baker's yeast to identify genes essential for autophagy. He then went on to elucidate the underlying mechanisms for autophagy in yeast and showed that similar sophisticated machinery is used in our cells.*

Ohsumi's discoveries led to a new paradigm in our understanding of how the cell recycles its content. His discoveries opened the path to understanding the fundamental importance of autophagy in many physiological processes, such as in the adaptation to starvation or response to infection. Mutations in autophagy genes can cause disease, and the autophagic process is involved in several conditions including cancer and neurological disease.

Treatment of cancer and other neurodegenerative diseases can be found now with the help of this discovery.

Fact : Protein requirement for an adult human body is 0.8g/kg.

RESEARCH BY PROFESSORS

Catalyst-free microwave-assisted arylglyoxalbased multicomponent reactions for the synthesis of fused pyrans

This is one of the research work of Mr. Lokman Choudhary (Associate Professor) along with a research scholar Richa Mishra.

INTRODUCTION:

Microwave-assisted multicomponent reactions are one of the preferred reaction strategies in organic synthesis. Due to the short reaction time and low energy consumption in microwave heating as compared to the conventional heating process, microwave heating has gained tremendous popularity among organic, medicinal and material chemists. In addition to these, performing reactions under catalyst-free conditions, provide additional benefits, such as no toxicity and cost for the catalyst. Considering these virtues, in recent times microwave-assisted catalyst-free MCRs have gained considerable interest in organic synthesis.

Pyrans fused with other cyclic molecules are abundant in various natural and bioactive synthetic products. Pyranoquinoline (pyran fused with quinoline) core is found in many alkaloids such as indersine, oricine, veprisine, and (+)-orixalone D. These bioactive alkaloids and their derivatives exhibit wide range of pharmacological activities such as antiallergic, anti in ammatory, psychotropic, and estrogenic activities. Similarly, pyrans fused with naphthoquinone derivatives such as kalafungin and lapachone show anticancer, anti ammatory and antibacterial, activities. Likewise, pyrans fused with coumarins (pyranocoumarins) possess broad pharmacological activities such as anticancer, anti-hepatitis B virus, anti HIV-1, anti-flammatory, antimicrobial, and antiproliferative activity etc.

In addition, they are used as photoactive drugs for skin disorders. Pyranocoumarins are also used as anti-hyperglycemic and anti-dyslipidemic agents. Structures of a few representative bioactive fused pyrans . Considering their widespread applications there is a continuing effort to synthesize either

new fused pyrans or to develop new methodology for their synthesis. In the literature, a few methods are known for the synthesis of coumarin fused pyrans having benzoyl substituent using multicomponent approach using various catalysts such as $NH_4H_2PO_4$, graphene oxide etc. Although these methods are useful for the synthesis of coumarin fused pyrans still these methods are limited only towards the synthesis of pyranocoumarins whereas we were looking for a versatile and greener methodology for the construction of diverse functionalized pyrans fused with quinolone, naphthoquinone, pyrone as well as coumarins.

In this paper we are reporting a three component reaction involving arylglyoxal monohydrate, malononitrile, and cyclic 1,3-dicarbonyls such as 4-hydroxy-1-methyl-2(1H)-quinolone, 2- hydroxy naphthoquinone, and 4-hydroxyl coumarins.

CONCLUSION:

In conclusion, we have developed a straight forward one-pot three component reaction for the easy access of diverse fused pyrans tethered with amino, nitrile and benzoyl group. Due to the presence of these reactive functional groups on the synthesized fused pyrans, it is expected that further cyclization/ modification of these molecules will be possible to synthesize new polycyclic heterocycles. The salient features of this methodology are: short reaction time, avoids column chromatographic purification and applicable to a wide range of substrates.

Q & A ZONE

Welcome back to the most awaited section of the magazine. This time we are here with a twist. Since we have seen an internship experience last time, let's switch to project work this time. Brij Saxena (Final year CST student) who did his project in IOCL shared with us his experiences about the same. So let's see what he revealed..

ThC : Please tell us a little about your project work.

BRIJ : I did my project on "Reproducibility study and establishment of material balance calculation for ZSM-5 zeolite production at industrial scale." I started this project in May, 2016. It was part of my summer training at Indian Oil R&D Division. The aim of the project was to collect data for industrial scale up of ZSM-5 production by first carrying out the process at lab scale and then scaling it up to get approximate data for industrial scale production as well as to find out the reproducibility of ZSM-5 from the mother liquor.

ThC: How did you select the topic for the project?

BRIJ : I had 4-5 choices of projects when I joined IOCL as a trainee. I chose the above mentioned project based on my background knowledge of the topic and its practical applicability. This topic provided me a good opportunity to apply my theoretical knowledge of chemical synthesis at the laboratory scale as well as to enhance my engineering skills by relating the process to Chemical Industry at process engineering level.

ThC : What were the problems you faced while doing project ? How did you manage to overcome that?

BRIJ : As such I did not face much problem during the course of the project. My mentor and all other members of the department were very helpful and supported me during the training period. The only problem was that equipment and apparatus for the experiments was limited so I had to wait some times for my turn while other researchers were working on them. I utilized that time by visiting other departmental labs at IOCL as it helped me to know about many other processes in petroleum refining.

ThC : How one can get funds for project? Do institute help in getting it?

BRIJ : Yes, our institute help in getting funds for the project. For the academic projects, student work under the mentorship of professor. The professor in-charge can arrange the items required for the project if they are available in the institute or they can also pass fund to purchase new item for the project. But there is a limit to the amount that can be spent on such items. Students can also undertake projects under clubs like RTDC. In such cases the faculty in-charge of the club can pass certain amount of fund for the project work.

ThC : What kind of work mainly one has to do while doing project?

BRIJ : It depends on the type of project that a student has undertaken. Literature survey is one of the most important tasks that should be done thoroughly before starting any project work.

Background knowledge of available technology and methods and the previous work done in that field is very important for the success of any project. Rest of the work depends on the requirement of project that whether it is theoretical or experimental.

ThC : Some suggestions for juniors.

BRIJ : I would suggest that you start exploring your areas of interest from the beginning of second year. Reading articles on current research and technology development will help in developing understanding of various different fields and you will be able to make good decision while choosing your project.

ThC : Thanks for sparing your precious time for this little talk sir.