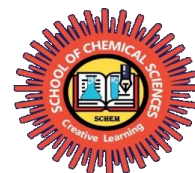




# 24<sup>th</sup> Refresher Course in Chemistry

January 11 – 24, 2022



*Organized by*  
**Human Resource Development Centre**  
**Devi Ahilya University, Indore (M.P.)**  
*In Association with*  
**School of Chemical Sciences**

## **Report of the Refresher Course**

*Patron*

**Dr.Renu Jain**

**Vice Chancellor**

**Devi Ahilya University, Indore**

*Director*

**Dr.Namrata Sharma**

*Coordinators*

**Dr.Pratibha Sharma**

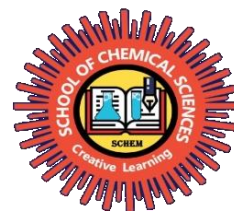
**Dr.Savita Khare**

**School of Chemical Sciences,  
Devi Ahilya University, Indore (M.P.)**



# 24<sup>th</sup> Refresher Course in Chemistry

January 11 – 24, 2022



*Organized by*  
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Devi Ahilya University, Indore (M.P.)  
*In Association with*  
**School of Chemical Sciences**

## Inaugural Session



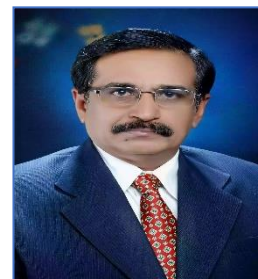
**Dr. Namrata Sharma**  
Director  
Human Resource Development  
Centre, Devi Ahilya University,  
Indore



**Prof. Rajneesh Misra**  
Chief Guest  
Indian Institute of Technology,  
Indore



**Prof. Renu Jain**  
Vice-Chancellor  
Devi Ahilya University,  
Indore



**Prof. Ashok Kumar**  
Rector  
Devi Ahilya University,  
Indore



**Prof. Pratibha Sharma**  
Course Coordinator



**Prof. Savita Khare**  
Course Coordinator

## Our Eminent Resource Persons



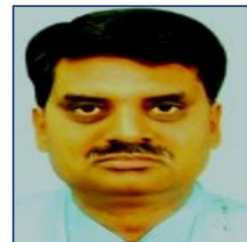
**Dr. S. K. Shukla**  
Central Drug Research Institute,  
Lucknow



**Prof. Rajneesh Misra**  
Discipline of Chemistry,  
Indian Institute of Technology,  
Indore



**Prof. D. S. Rawat**  
Department of Chemistry,  
University of Delhi, Delhi



**Prof. V. K. Tiwari**  
Banaras Hindu University,  
Varanasi



**Prof. Anjali Patel**  
Maharaja Sayajirao University of  
Baroda, Vadodara Gujarat



**Dr. Suban K. Sahoo**  
Sardar Vallabhbhai National  
Institute of Technology, Surat,  
Gujarat



**Prof. Pawan K. Sharma**  
Department of Chemistry,  
Kurukshetra University,  
Kurukshetra



**Prof. S. K. Gupta**  
School of Studies in Chemistry,  
Jiwaji University, Gwalior (M.P.)

## Our Eminent Resource Persons



**Dr. Shaikh M. Mobin**  
Discipline of Chemistry,  
Indian Institute of  
Technology, Indore (M.P.)



**Dr. Chelvam Venkatesh**  
Discipline of Chemistry,  
Indian Institute of Technology,  
Indore (M.P.)



**Prof. Ashu Rani**  
Department of Chemistry,  
University of Kota, Kota,  
Rajasthan



**Dr. Gokulnath Sabhapati**  
School of Chemistry, IISER,  
Thiruvananthapuram



**Dr. Sanjay K. Singh**  
Discipline of Chemistry,  
Indian Institute of Technology,  
Indore (M.P.)



**Dr. Dipak K. Roy**  
Discipline of Chemistry,  
Indian Institute of Technology,  
Indore (M.P.)



**Dr. Tushar K. Mukherji**  
Discipline of Chemistry,  
Indian Institute of Technology,  
Indore (M.P.)



**Prof. Rajeev Jain**  
Pondicherry University,  
Puducherry

## Our Eminent Resource Persons



**Prof. A. P. Mishra**  
Department of Chemistry,  
Dr. H. S. Gour Central  
University, Sagar (M.P.)



**Prof. Chitra Pande**  
School of Chemistry,  
Kumaun University, Nainital,  
Uttarakhand



**Dr. Amrendra K. Singh**  
Discipline of Chemistry,  
Indian Institute of  
Technology, Indore (M.P.)



**Dr. Prashant Kodgire**  
Biosciences and Biomedical  
Engineering, IIT Indore (M.P.)



**Prof. A. V. Bajaj**  
School of Chemical Sciences,  
Devi Ahilya University,  
Indore (M.P.)



**Prof. Ashok Kumar**  
School of Chemical Sciences,  
Devi Ahilya University,  
Indore (M.P.)



**Prof. H. P. S. Chauhan**  
School of Chemical Sciences,  
Devi Ahilya University,  
Indore (M.P.)



**Prof. R. N. Patel**  
Department of Chemistry  
Awadhesh Pratap Singh  
University, Rewa (M.P.)



**Prof. Pratibha Sharma**  
School of Chemical Sciences,  
Devi Ahilya University, Indore  
(M.P.)



**Prof. Savita Khare**  
School of Chemical Sciences,  
Devi Ahilya University, Indore  
(M.P.)



**Prof. Uma Sharma**  
School of studies in Chemistry  
and Biochemistry, Devi Ahilya  
University, Indore (M.P.)



**Prof. A. G. Fadnis**  
Retd. Principal,  
Govt. College Harsud (M.P.)

## Judges for Seminar Presentation



**Prof. Rajesh Sharma**  
School of Pharmacy,  
DAVV, Indore (M.P.)



**Dr. H. S. Parmar**  
School of Biotechnology,  
DAVV, Indore (M.P.)

## Our Beloved Participants



Mr. Ram Kumar Saraswat,  
Assistant Professor,  
St.John's College, Agra, (U.P.)



Mr. Prakash Barfa  
Assistant Professor,  
B. K. S. N. Govt. College,  
Shajapur (M.P.)



Dr. Sachin Shantaram Borse,  
Assistant Professor,  
Smt. V. U. Patil Arts and Late Dr.  
B. S. Desale Science College Sakri,  
Tal- Sakri, Dist- Dhule, (M.S.)



Dr. Abdul Wajid Abdul  
Razique Assistant Professor,  
Shri Shivaji College of Arts,  
Commerce and Science,  
Akola (M.S.)



Mr. Gholap Dnyaneshwar  
Purushottam, Assistant Professor,  
Smt. C. H. M. College, College,  
Ulhasnagar Dist. Thane (Mumbai)



Dr. Rajashree Ajay Markandewar  
Assistant Professor, Rashtrapita  
Mahatma Gandhi Arts Commerce  
and Science College, Saoli Dist.  
Chandrapur (M.S.)



Dr. Bhagat S. M., Assistant  
Professor, I. C. S. College of  
arts, Comm. and Science,  
Khed. Dist. - Ratnagiri. (M.S.)



Ceril Jeoffrey A  
Assistant Professor  
St. Joseph', College  
Tiruchirapalli, Tamilnadu



Dr. Uday Singh Patel  
Assistant Professor,  
D.A-V PG College Kanpur  
(U.P.)



Dr. Dileep Kumar Singh,  
Assistant Bipin Bihari  
College, Jhansi, (U.P.)



Dr. Parshuram D. Maske  
Assistant Professor, Art's  
Commerce and Science  
College, Onde, Dist-Palghar  
(M.S.)



Dr. A. Shanavas, Assistant  
Professor, The New  
College, Chennai, Tamil  
Nadu



Dr. Suraj Butoliya, Assistant  
Professor, Shri Ramdeobaba  
College of Engineering and  
Management Nagpur



Dr. Giridhari Hazra,  
Assistant Professor,  
G. L. M. College,  
Banmankhi, Purnia,  
Bihar



Dr. Archana Ankush Kachare  
Assistant Professor  
Sunderrao Solanke  
Mahavidyalaya Majalgaon  
Dist. Beed (M.S.)



Mr. Ramesh Kumar Auchat  
Assistant professor,  
Jawaharlal Nehru Govt.  
Degree College Barwaha  
Dist. Khargone (M.P.)



**Mr. Daniel Prasad ,  
Assistant Professor,  
Govt. Chandra Vijay College ,  
Dindori (M.P.)**



**Dr. Abhishek Upadhyay,  
Assistant Professor, B. S. N.  
V. Postgraduate College  
University of Lucknow**



**Dr. Lalit Prakash Gupta,  
Assistant Professor, B. S. N.  
V. P. G. College, University  
of Lucknow, Lucknow**



**Dr. Anil Dharmaraj Kakuste ,  
Assistant Professor, S. V. U.  
P. Arts and Dr. B. S. Desale  
science college Sakri, Dist -  
Dhule (M.S.)**



**Mr. Lokesh Jharbade,  
Assistant Professor,  
Dr. Bhimrao Ambedkar  
Govt. College,  
Amla, Dist. Betul (M.P.)**



**Dr. Naveen Awasthi,  
Assistant Professor, Janta  
College Bakewar Etawah,  
Uttar Pradesh**



**Mr. Sadik Ahmed Sheikh,  
Assistant Professor,  
Shaheed Bheema Nayak  
Govt. PG College  
Barwani, (M.P.)**



**Dr. Akhilesh Shende,  
Assistant Professor, Govt.  
College Kurai, District  
Seoni, (M.P.)**



**Dr. Shrikrishna Sharmrao  
Ubarhande , Assistant Professor  
G.S. Tompe Art's Commere and  
Science College Chandur  
Bazar. Dist Amravati (M.S.)**



**Mr. ABHAY SINGH,  
Assistant Professor, Sri Baldev  
PG College Badagaon,  
Varanasi (U.P.)**



**Dr. Bassa Satyanarayana,  
Assistant Professor, Govt.  
M.G.M PG College, Itarasi,  
(M.P.)**



**Dr. Urmila Raghuvanshi,  
Assistant Professor, Shri  
G. S. Institute of  
Technology and Science,  
Indore, (M.P.)**



**Mr. Mahesh Baviskar  
Assistant Professor Govt. PG  
College Sendhwa Dist. Barwani  
(M.P.)**



**Dr. Sandip Balu Chaudhari  
Assistant Professor, S.P.D.M  
Arts, Commerce and  
Science College, Shirpur  
(M.S.)**



**Dr. Sanjay Kumar Singh,  
Assistant Professor, Govt.  
Bapu College, Nowgong (M.P.)**



**Dr. Satyaprakash Verma  
Assistant Professor Govt.  
College, Jaitpur Dist.  
Shahdol (M.P.)**



**Ms. Asmita Sandesh Naik Gaonkar, Assistant Professor, Government College of Arts, Science and Commerce - Quepem, Goa.**



**Dr. Tejendra Rajput Assistant Professor, Art's Commerce and Science College Onde Tal Vikramgad Dist. Palghar (M.S.)**



**Dr. Dinesh Anandrao Pund Assistant Professor, Shri R. R. Lahoti Science College, Morshi, Dist.-Amravati, (M.S.)**



**Dr. Santosh Rangnath Deshmukh, Assistant Professor Ahmednagar College Ahmednagar (M.S.)**



**Mr. Billorsingh Senani, Assistant professor, Govt. College Sanawad Dist. Khargone (M.P.)**



**Miss Kavita Nagar, Assistant Professor, Department of Chemistry, Government College Jaitpur Dist. Shahdol (M.P.)**



**Dr. M.S. Lunge Assistant professor, Jagadamba Mahavidyalaya, Achalpur, Dist. Amravati (M.S)**



**Mr. Dhiraj Sonawane. Assistant professor, SPDM Arts, Commerce, and Science College Shirpur, Dist. Dhule (M.S)**



**Miss Swati Singh Assistant Professor, Dr. SSN Govt. College Malanjhand, Dist. Balaghat (M.P.)**



**Dr. Jayant Rathod, Assistant Professor Government Science College Dhanpur Dist. Dahod Gujarat**



**Ms. Mitisha Baid, Assistant Professor, Government Nagarjuna Post Graduate College of Science, Raipur (Chhattisgarh)**



**Dr. M. Ganapathi, Assistant Professor Vivekananda College Tiruvedakam West Madurai, Tamil Nadu**



**Dr. Biswajit Gopal Roy, Assistant Professor, Department of Chemistry, Sikkim University, Gangtok, Sikkim**



**Dr. Laveena Paul Chouhan Assistant Professor SCA Govt. PG College Jhabua (M.P.)**



**Dr. Yogesh Chandra Nainwal Assistant professor Dr. Shivanand Nautiyal Government PG College Karanprayag, Uttarakhand**



**Dr. Sheetal Shrial Assistant Professor, Rajiv Gandhi Government PG College, Mandsaur (M.P.)**



**Dr. Chetana Yogesh Patil,**  
Assistant Professor, Arts,  
Commerce and Science  
College, Onde, Vikramgad,  
Maharashtra



**Dr. Ranjeet Singh Chauhan,**  
Assistant Professor,  
Gochar Mahavidyalaya, Rampur  
Manihran, Saharanpur, (U.P.)



**Dr. Yogesh Kashinath Patil,**  
Assistant ,Arts, Commerce and  
Science College Onde,  
Vikramgad, (M.S.)



**Dr. Reena Gami**  
Assistant Professor  
Rajiv Gandhi Government P.G  
College, Mandsaur (M.P)



**Mr. Prashant Rameshwarrao**  
Yawale, G. S. Tompe Arts,  
Commerce and Science College,  
Chandur Bazar, Dist. Amravati,  
Maharashtra



**Dr. S. Shahida Parveen**  
Assistant Professor  
M.S.S.WakfBoard College  
Madurai Tamilnadu



**Miss Lalita Singh**  
Assistant Professor of  
Chemistry , Govt. College  
Deosar , Singrauli (M.P.)



**Dr. Praveen Tyagi**  
Assistant Professor  
St. John's College, Agra (U.P.)



**Dr. Suresh Chandra Yadav,**  
Assistant Professor satish  
Chandra College Ballia (U.P.)



*Report on*  
**24<sup>th</sup> Refresher Course in Chemistry (IDC)**

**11-01-2022 to 24-01-2022**  
**(Online Mode)**

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Refresher Course in Chemistry on the theme “Synthetic and Analytical Chemistry “ was organised by UGC-Human Resource Development Centre, Devi Ahilya University, Indore in association with School of Chemical Sciences, Devi Ahilya University, Indore, from January 11, 2022 to January 24, 2022.

**Day 01; Date: 11/01/2022**

**Time: 10:30 AM to 01:30 AM**

**Session: I, Inaugural Session**

**Chief Patron:-Dr.Renujain, Hon’ble Vice-Chancellor, Devi Ahilya University, Indore**

**Chief Guest:- Dr. Rajneesh Mishra, IIT, Indore**

Dr. Namrata Sharma, Director HRDC-DAVV, Indore along with Course Coordinator Dr. Pratibha Sharma, Professor, School of Chemical Sciences, Devi Ahilya University, Indore, welcomed the Guests Dr. Renu Jain, Hon’ble Vice-Chancellor, Devi Ahilya University,



Indore, Dr. Rajneesh Misra, Professor, Discipline of Chemistry, IIT Indore and participants from various parts of the country. Hon’ble Vice-Chancellor Dr. Renu Jain delivered the presidential address and inaugurated the session. She discussed the significance of a refresher

course for faculty, stating that it can serve as a wake-up call to remind them of their Teacher and Researcher roles in light of global needs. It enhances their professional ethics. Dr. Rajneesh Misra. emphasizes the role of an academician and researcher to the society. Dr. Pratibha Sharma introduced the chief guest of the inaugural session, Dr. Rajneesh Misra, and informed the participants about the course's expectations as it progressed. She shared some insights on the course's various evaluation criteria. The participants were encouraged to make all the sessions as much interactive as possible by raising questions to the resource persons. At the end, Dr. Savita Khare, Professor, School of Chemical Sciences, Devi Ahilya University, Indore offered vote of thanks to the guests and all the participants.

**Date: 11/01/2022; Time: 11:30 AM To 01:00 PM**

**Session: II**

**Resource Person:** Prof. A. V. Bajaj, Retd. Professor, School of Chemical Sciences, Devi Ahilya University, Indore



**Topic: Pericyclic Reactions**

In this session, the resource person was Prof. A. V. Bajaj, Ret. Professor, School of Chemical Sciences, Devi Ahilya University, Indore. Mr. Ceril Jeffrey, Assistant Professor, St. Joseph's College (Autonomous), Tiruchirapalli, Tamil Nadu, one of the participants coordinated the session and introduced the resource person to the participants. Initially Dr. A. V. Bajaj gave information about the term 'concerted reaction' related to Pericyclic reaction. He explained the types of Pericyclic reactions involving electrocyclization, cycloaddition and sigmatropic rearrangements with pertinent examples. He told that the actual chemical synthesis began after winning the Nobel Prize by R.B. Woodward in 1965. His mode of communication was bilateral. He used Woodward-Hoffman theory for prediction of the stereochemistry of the pericyclic reactions. The concept of cyclobutene formation under the photochemical condition with the help of Woodward-Hoffman was also explained by him. At the end of the session, vote of thanks to the resource person was proposed by Mr. Ceril Jeffrey.

**Examples of pericyclic reactions, continued:**

Example of a cycloaddition to give a 6-membered ring:  
(one *cis* or *Z* alkene, and a *E,E*-diene) heat One diastereoisomer is favoured.  
(Diels-Alder reaction!)

3) Sigmatropic rearrangement reactions: These involve a concerted migration of atoms or of groups of atoms. E.g. migration of a  $\sigma$ -bond. The numbering refers to the number of atoms in the transition state on either side of where bonds are made or broken.

[1,2] This would be classified as a [1,2]-sigmatropic rearrangement (or shift).

[1,5] This would be classified as a [1,5]-sigmatropic rearrangement.

01:56:17 Request control

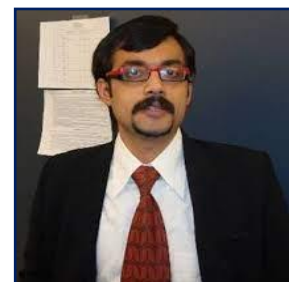
DT NS DR DP CA  
Dr. Pratibha Sharma (Guest) Dr. URMILA RAGHUV... Dr. Uday Singh Patel (Guest) Ceril Jeffrey A (Gues)

**Dr. A. V. Bajaj discussing about Pericyclic Reactions**

Date: 11/01/2022 ; Time: 02:00 PM To 03:30 PM

Session: III

Resource Person: Dr. Rajneesh Misra, Discipline of Chemistry, IIT Indore



Topic: Functionalised BODIPYs

In the post lunch session of the first day of the course, Dr. Rajneesh Misra, Professor, Discipline of Chemistry, IIT Indore was the resource person. Mr. Ceril Jeffrey coordinated the session and introduced the resource person to the participants. Dr. Rajneesh Mishra discussed the Donor-Acceptor Molecular system for photonic and electronic applications. He also discussed about different Donor-Acceptor Dyes and their importance. BODIPY is an abbreviation for "boron-dipyrromethene". He explained applications of BODIPYs, quenching of fluorescence as an indicator of very small change in Donor strength of various carbazoles and synthesis of carbazole substituted meso alkylated BODIPYs. He also gave the details of adsorption spectra carbazole substituted BODIPYs in different solvents. He shared the research work on BODIPYs, their synthesis and spectra. The way he connected and explained everything was incredible. At last he explained about the energy transfer, charge transfer and electron transfer mechanism. Vote of thanks to the speaker was extended by Mr. Ceril Jeffrey

**Nature, Porphyrins and BODIPYs**

**Diverse functions of Porphyrin in Nature**

- Chlorophyll the photoreceptor.
- Hemoglobin the oxygen-transport metallo-protein

The basic structure is a porphyrin ring.

*Little sister of Porphyrin*

Participants: Rajneesh (Guest), Dnyaneshwar..., and another participant.

Dr. Rajneesh Misra discussing about Nature, Porphyrins and BODIPYs

**Date: 11/01/2022; Time: 03:30 PM To 05:00 PM**

**Session: IV**

**Resource Person:** Dr. Amrendra K. Singh,  
Discipline of Chemistry, IIT Indore



**Topic: - N-Heterocyclic Carbene Ligands**

In the last session of the inaugural day, Dr. Amrendra K. Singh, Discipline of Chemistry, IIT, Indore was the resource person. Mr. Ceril Jeffrey coordinated the session and introduced the resource person to the participants. Dr. Amrendra K. Singh started his talk with the basic information on carbene, their singlet- triplet states and about the first isolated carbene. He mainly emphasizes on N-Heterocyclic carbene ligands. He also discussed about history, isolation and stability of the ligand. Following that, he went into detail about the elements that can form complexes with these ligands. He explained NHC-Metal bond nature. He gave the methods of formation of NHCs and synthetic strategies to NHC-Metal complexes. He also discussed about abnormal NHC and its donor strength with compare to NHC and phosphine. Finally, he explained various synthetic procedures for the synthesis of NHC based pincer complexes and their characterization. All participants found the entire discussion to be interesting and informative.

A screenshot of a presentation slide titled "WHAT ARE CARBENES?". The slide contains a bulleted list of properties and three chemical structures. The structures are:  $\text{H}-\overset{\cdot\cdot}{\text{C}}-\text{H}$ ,  $\text{F}-\overset{\cdot\cdot}{\text{C}}-\text{F}$ , and  $\text{Ar}-\overset{\cdot\cdot}{\text{C}}-\text{Ar}$ . The presentation is shown within a video call interface with a sidebar on the right showing participants: Amrendra K. Sin... and Dr. Archana A... The name "Amrendra K. Singh (Guest)" is visible at the bottom left of the slide area.

**Dr. Amrendra K. Singh giving information on carbenes**

Day 02; Date: 12/01/2022; Time: 10:00 AM To 11:30 AM

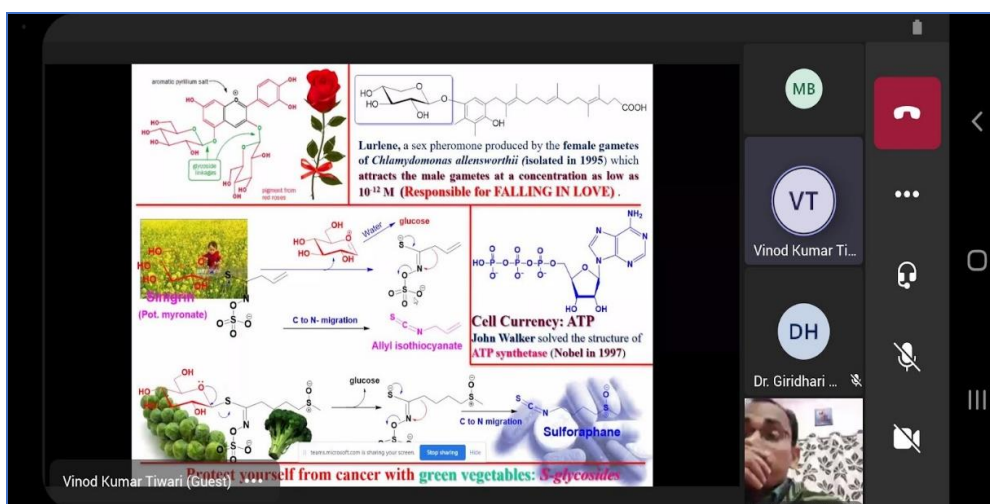
Session: I

**Resource Person:** - Prof. Vinod Kumar Tiwari, Professor, Organic Chemistry, Department of Chemistry, Banaras Hindu University, Varanasi, (U.P.), India



**Topic:- Synthetic Chemist and our Society.**

In first session of the 2<sup>nd</sup> day of the course, Prof. Vinod Kumar Tiwari, Professor, Organic Chemistry, Department of Chemistry, Banaras Hindu University, Varanasi was the resource person. Dr. Akhilesh Shende, Assistant Professor, Govt. College Kurai, Dist. Seoni (M.P.) coordinated the session and introduced the resource person to the participants. Prof. Tiwari began his presentation by discussing carbohydrate in nature in various forms such as red rose pigment, pheromones, cell currency ATP, and so on. After that he discussed about synthetic sweeteners like Alitame, Lugduname (2,25,000 times sweeter), organic compounds as medicine and some explosives. He said that the great discoveries are often happen by serendipity. He explained how to handle the problems of these chemicals for environment and health related issues. He explained structures of some potent carbohydrate based molecules. He also explained the different methods of synthesis such as one pot three enzyme synthesis of Sialosides, chemo-enzymatic synthesis, copper catalyzed Click reaction, synthesis of glycoconjugate benzothiazoles via cleavage of Benzothiazole ring. He concluded that synthetic chemist have great role for making our life easy, healthy and pleasant. The talk was very interesting and informative.



**Prof. V. K. Tiwari initiate his talk with the Carbohydrate in nature in different forms.**

**Date: 12/01/2022; Time: 11:30 AM To 1:00 PM**

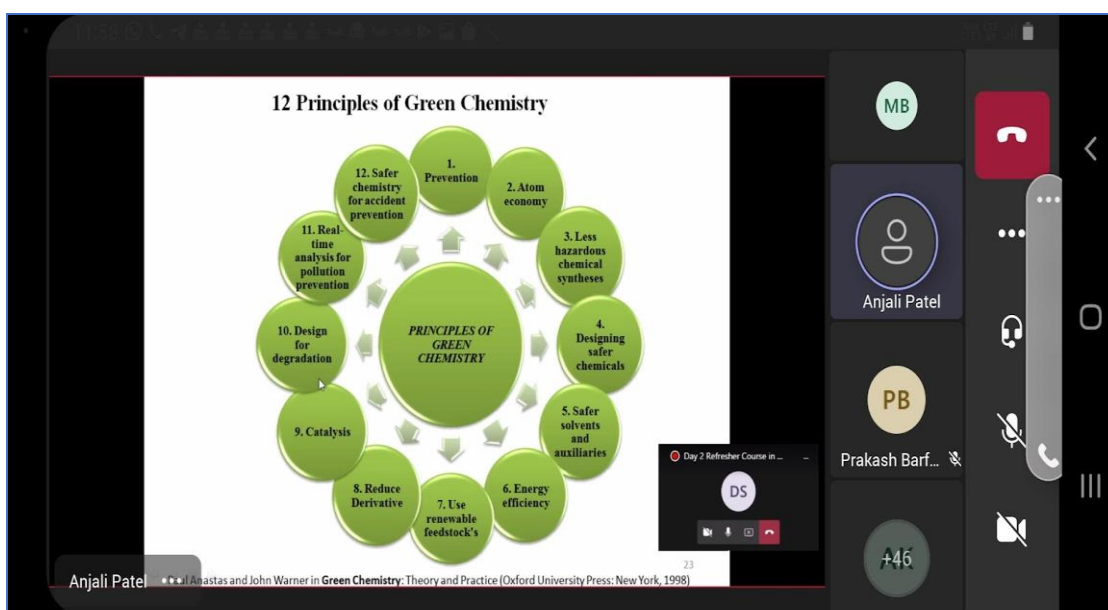
**Session: II**

**Resource Person:** - Dr. Anjali Patel, Professor, Maharaja Sayajirao University of Baroda, Vadodara (Gujarat)



**Topic:- Green Chemistry**

Dr. Dinesh AnandraoPund, Assistant Professor, Shri RR Lahoti Science College, Morshi, Dist. Amravati (M.S.) coordinated the session and introduced the resource person to the participants. Initially Dr. Anjali Patel gave information about the history of environment movement and green chemistry. She told that Chemistry has improved our quality of life and made thousands of products possible. She narrated that ‘Sustainability is Goal and Green Chemistry is the Tool’. She explained all the 12 principles of Green Chemistry that are Waste Prevention, Atom Economy, Less Hazardous Chemical Syntheses, Designing Safer Chemicals, Safer Solvents and Auxiliaries, Design for Energy Efficiency, Use of Renewable Feedstocks, Reduce Derivatives, Catalysis, Design for Degradation, Real-time analysis for Pollution Prevention, Safer Chemistry for Accident Prevention with Laboratory examples as well as in daily life. She also urged that the scientific community as well as society as a whole should raise their voice and looking for solutions to address the problem. It is the duty of chemistry teachers that they inspire their students for green chemistry aspects. The whole session was very insightful.



**Dr. Anjali Patel explaining the 12 principles of Green chemistry.**

**Date: 12/01/2022; Time: 2:00 PM To 3:30 PM**

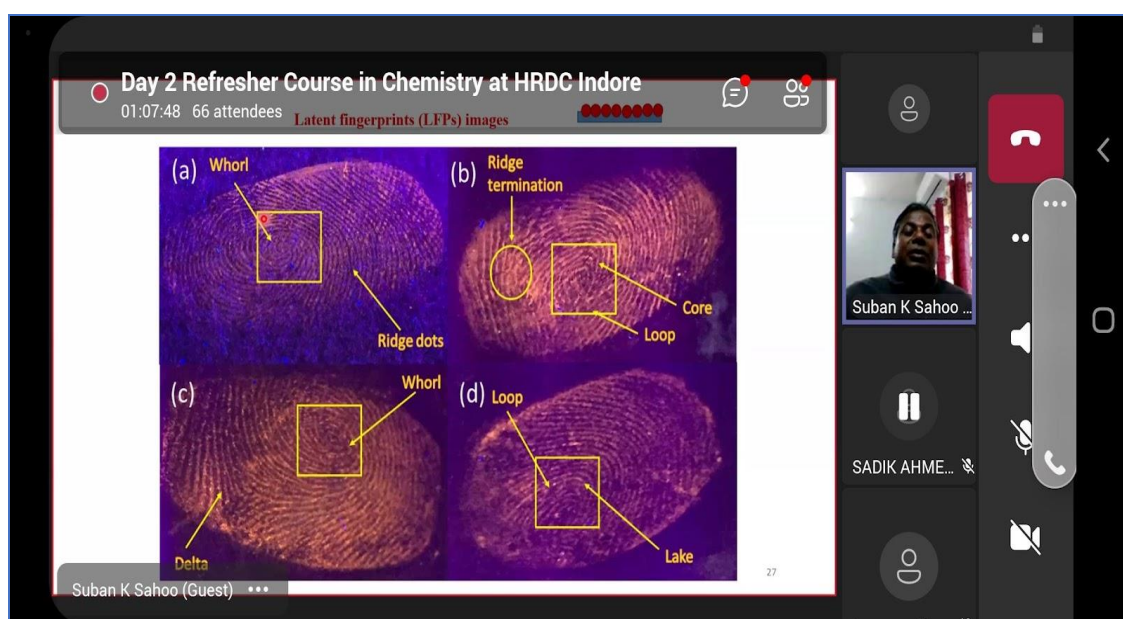
**Session: III**

**Resource Person: - Dr.Suban K. Sahoo, Professor, SVNIT, Surat (Gujarat)**



**Topic:- Fluorescence Chemosensing.**

The session began with the introduction of the resource person by Dr. Bassa Satyanarayana, Assistant Professor, Govt. MGM PG College, Itarsi (M.P.). The resource person Dr. Suban K. Sahoo, Professor, SVNIT, Surat (Gujarat) initiated his talk with the explanation of some basic terms like Luminescence, Stokes shift, and quantum yield. Following that, he discussed some of the factors that influence whether a molecule fluoresces, such as its quantum yield and the intensity of the emitted radiation. He also explained fluorophores, their structures and solvent effect on it. Types of quenching, inner filter effect, Forsters Resonance Energy Transfer were also explained by him. He defined that chemosensor is a molecule of abiotic origin that signals the presence of matter or energy. He gave the details about Reporter, Sensing mechanism, Recognition unit. He also explained the different applications of Fluorescence Chemosensing in biotechnology, analytical chemistry, forensics, toxicology etc. He discussed about metal nanoclusters, synthesis of nanoclusters and motivations to develop biosensors. It was wonderful and enlightening talk. The session was concluded with the vote of thanks proposed by Dr. Abdul Wajid, Assistant Professor, SS College of Arts, Commerce and Science Akola (M.S.).



**Dr. Sahoo explaining the different applications of Fluorescence**

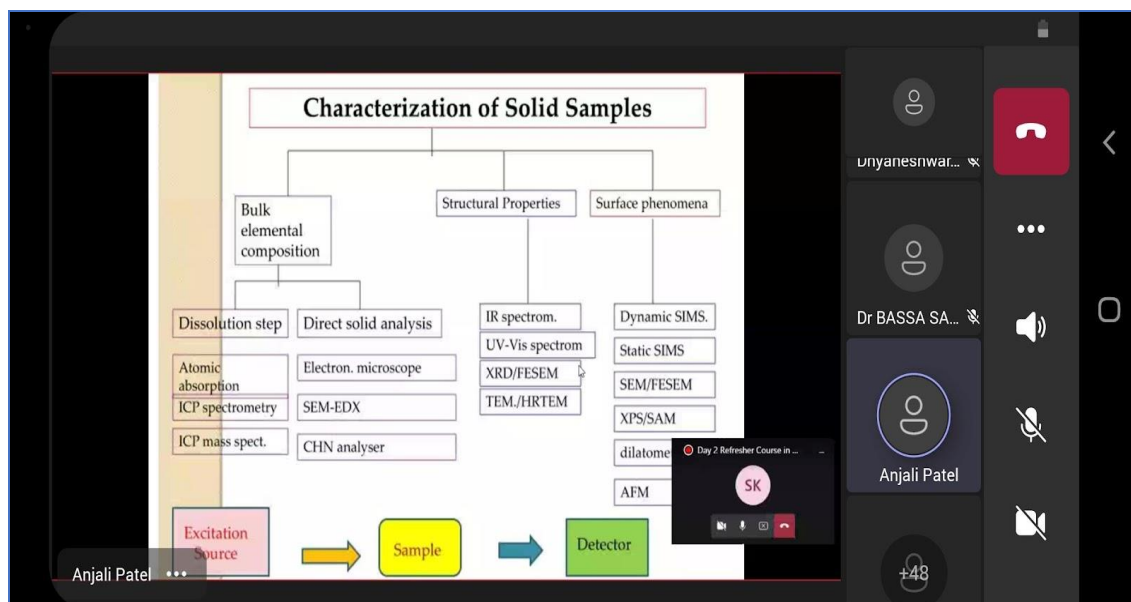
**Date: 12/01/2022; Time: 3:30 PM To 5:00 PM**

**Session: IV**

Resource Person: - Dr. Anjali Patel, Professor,  
The Maharaja Sayajirao University of Baroda, Vadodara (Gujarat)

**Topic:- Catalysis and Catalysts Characterization.**

In continuation of the previous lecture, Dr. Anjali Patel began her talk with the concept of activation energy. She discussed the preparation methods of heterogeneous catalyst which are broadly categorized as Bulk preparation, Impregnation and physical mixing. After that she discussed components of a typical heterogeneous catalyst. She focused on choice of support materials and the factors affecting it. Different types of supports and their key issues were also explained by her. She explained in detail about Catalyst characterization including chemical composition, porosity, surface area, morphology, location, oxidation state, pore size. She presented N-butyl amine titration, Potentiometric titration methods for Acidity characterization of the catalyst. The session was very interesting and informative. At the end of the sessions vote of thanks to the resource person was offered by Dr. Ramesh Achat, Assistant Professor Govt. College Barwaha, Dist. Khargone (M.P.)



**Dr. Anjali Patel explaining about catalyst Characterization**



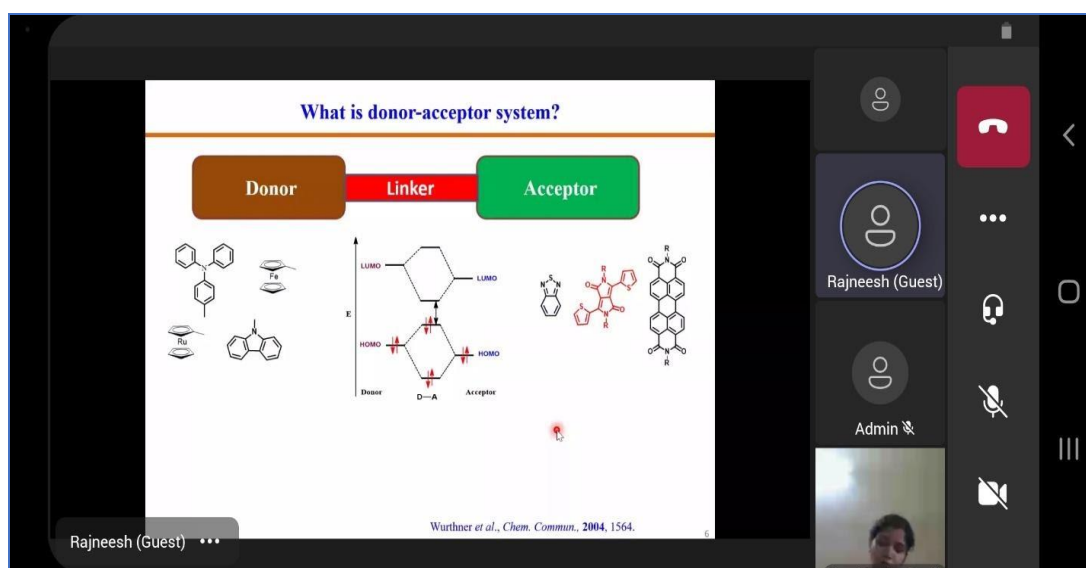
**Day 03; Date: 13/01/2022; Time: 10:00 AM To 11:30 AM**

**Session: I**

**Resource Person:** Dr. Rajneesh Misra, Professor,  
Discipline of Chemistry, IIT Indore

**Topic: Design Strategy for Near-Infrared Absorbing Diketopyrrolopyrrols**

In the first session, Dr. Rajneesh Mishra, Professor, Discipline of Chemistry, IIT Indore was the resource person. Mr. Prakash Barfa, Assistant Professor, B.K.S.N Govt. College, Shajapur (M.P.) coordinated the session and introduced the resource person to the participants. Dr. Rajneesh Misra started his talk by explaining why Near IR absorbing materials are important. He discussed NIR absorbing materials in Bioimaging. He presented the important and special properties of DPP as strong acceptor and extremely insoluble compounds. He explained the behavior of DPP as compounds with high fluorescence quantum yield, exceptional thermal and photochemical stability. He also discussed about different Donor-Acceptor Dyes and their importance. He also explained in detail about the applications of DPP ca. Laser dyes, Fluorescence imaging, solar cells, optical data storage and sensors. He Discussed that how DPP is discovered accidently and further synthesis of derivatives of DPP. He shared their synthesis, mechanisms and spectra. The manner in which he correlated and explained everything was exceptional. Prof. Misra interacted with the participants and answered their questions at the end of the session after his very interesting and informative lecture. The vote of thanks to resource person was proposed by Mr. Mahesh Baviskar, Assistant Professor, Govt. PG College, Sendhwa, Dist. Barwani, (M.P.).



**Dr. Rajneesh Misra Explaining about Donor-Acceptor system**

**Date: 13/01/2022; Time: 11:30 AM To 1:00 PM**

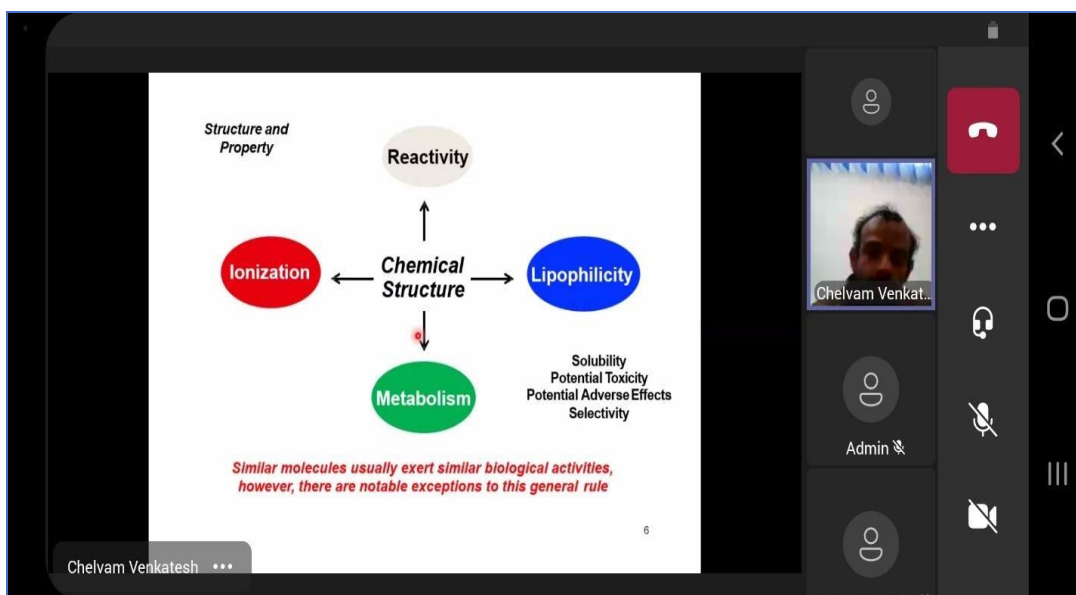
**Session: II**

**Resource Person:** Dr. Chelvam Venkatesh, Associate Professor,  
Discipline of Chemistry, IIT Indore



**Topic: Principles of Drug Discovery, Design and Development.**

The session began with the introduction of the resource person by Mr. Prakash Barfa. Dr. Chelvam Venkatesh, Associate Professor, Discipline of Chemistry, IIT Indore was the resource person. Dr. Chelvam Venkatesh began by discussing the history of drugs and diseases. Following that, he defined all of the terms that are necessary to understand the Principles of Drug Discovery, Design, and Development. He said that drug development includes drug formulation and drug delivery ADME, pharmacokinetics, pharmacology. Genomics can be used in compound evaluation, by providing molecular details about the effect of a compound on the body. Drug Targets and their Binding interactions like electrostatic, hydrogen bond, van der waals, dipole-dipole, ion-dipole, pi-stacking, hydrophobic and covalent are explained by him. At the end of the session, vote of thanks was proposed by Mr. Mahesh Baviskar, Assistant Govt. PG College, Sendhwa, Dist. Barwani (M.P.). The session was very insightful.



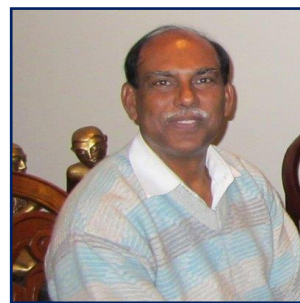
The screenshot shows a Zoom meeting interface. The main content is a slide titled "Structure and Property". The slide features a central diagram with "Chemical Structure" in the middle. Four arrows point outwards to "Reactivity" (top), "Lipophilicity" (right), "Metabolism" (bottom), and "Ionization" (left). To the right of "Metabolism", there is a list of associated factors: "Solubility", "Potential Toxicity", "Potential Adverse Effects", and "Selectivity". At the bottom of the slide, a red text note reads: "Similar molecules usually exert similar biological activities, however, there are notable exceptions to this general rule". The Zoom interface includes a video thumbnail of Dr. Chelvam Venkatesh, a name tag "Chelvam Venkatesh", and various control icons like mute, video off, and chat.

**Dr.Chelvam Venkatesh Explaining about Structure and property of drug**

**Date: 13/01/2022; Time: 02:00 PM To 03:30 PM**

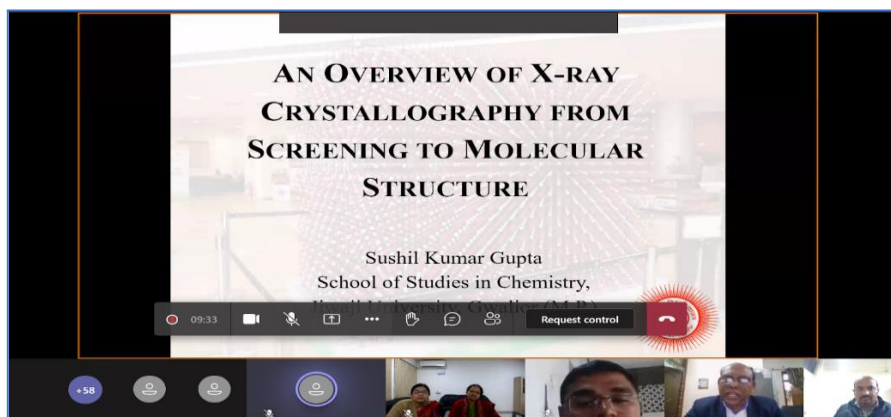
**Session: III**

**Resource Person:** Dr. S.K. Gupta, Professor,  
School of Studies in Chemistry, Jiwaji University, Gwalior



**Topic: An Overview of X-RAY Crystallography from Screening to Molecular Structure.**

The session was coordinated and introduced by Mr. Sadik Ahmed Sheikh, Assistant Professor, Department of Chemistry, SBN Govt. PG College Barwani (M.P.). The resource person Dr. S.K. Gupta, Professor, Department of Chemistry, Jiwaji University, Gwalior; explained X-ray crystallography in a captivating manner by including various images and a video in his presentation. He began with the brief introduction to history of X-ray. He showed a video on the various applications of X-rays in the field of Astronomy. He explained very well the importance of studying crystal structure in the field of chemistry and why it has become an intricate part in modern science. The apt size of crystal and the amount of material to be taken so as to obtain proper crystallographic study was illustrated. The type of solvents to be used and on what basis the choice may be made was discussed. He provided valuable information on the method of developing good quality crystals. The different methods of developing the crystals (organic as well as inorganic) like slow evaporation slow cooling, vapour diffusion etc. were discussed. In the second part, crystal evaluation was discussed in detail. Using apt diagrams positioning of crystal and the direction of the beam in the instrument was shown. Moreover, the application of X-ray Crystallography with respect to the COVID-19 pandemic was also elaborated by him. Indeed, it was an enlightening session. The session was concluded with the vote of thanks proposed by Dr. Sheetal Shrimal, Assistant Professor, Rajiv Gandhi Govt. PG College Mandsour (M.P.)



**Dr.S. K. Gupta Explaining about X-Ray Crystallography**

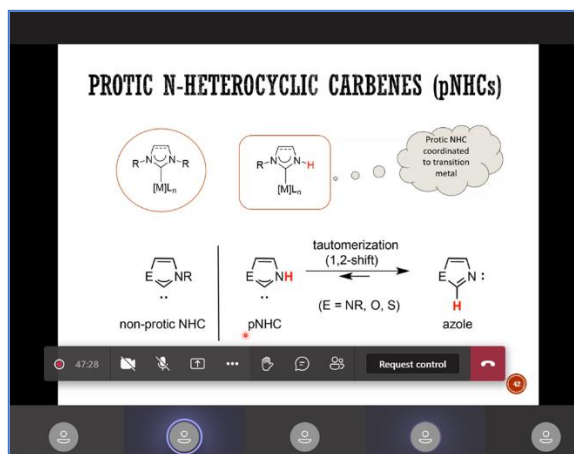
**Date: 13/01/2022; Time: 03:30 PM To 05:00 PM**

**Session: IV**

**Resource Person:** Dr. Amrendra K Singh,  
Discipline of Chemistry, IIT, Indore

**Topic:** N-Heterocyclic Carbene Ligands Part 2: Applications and Recent Developments

The resource person for this session was Dr. Amrendra K Singh, from Discipline of Chemistry, IIT, Indore. Introduction of the speaker was presented by Dr. Swati Singh, Assistant Professor, Dr. SSN Govt. College Malanjkhanda, Balaghat, (M.P.). Dr. Singh has divided his lecture in four sections. In the first section of lecture, Prof Singh talked about the recent developments and various applications of N-heterocyclic carbene ligands (N-HCS). He explained process and the mechanisms of catalytic hydrogenation and dehydrogenation of ketones and alcohols by using Ru (II) complexes and also by Ru(II) CNC-Pincer complexes.. Further he explained the comparative catalytic activity of four different complexes, developed in his lab. He also explained microwave heating is preferably more efficient than thermal heating for alcohol dehydrogenation. In the second section of lecture, Professor Singh has explained process and importance of dehydrogenative coupling of amines and alcohols using the Ru(II) CNC-Pincer complexes. He discussed comparative catalytic activity of four different complexes, developed in his lab. Also, he has explained the effect of microwave and thermal heating in terms of time and temperature. In the third section of lecture, he shared the description on four newly synthesized Ru(II) pincer complexes with the



participants and explained about their comparative catalytic, electronic and steric effect studies. In the fourth session Dr. Singh shared his very innovative finding about “Protic N- Heterocyclic Carbene (pNHCs). He explained the possible preparation methods of pNHC complexes, various examples, synthesized pNHC complexes in IIT Indore lab, their NMR and mass spectrophotometric

studies and their applications in catalysis. Prof. Singh interacted with the participants and answered their questions at the end of the session, following his very interesting and informative lecture. Dr. Singh responded to participants' questions about the effect of chairality on complex catalytic activity, as well as the safety and precautions in the use of Ru(II) complexes. Finally vote of the thanks was offered by Dr. Sheetal Shrimal.

**Day 04; Date: 14/01/2022; Time: 10:00 AM To 11:30 AM**

**Session: I**

**Resource Person:** Dr. Chelvam Venkatesh, Department of Chemistry, IIT, Indore

**Topic: Concept and application of Drug Discovery**

The distinguished speaker of the today's first session was Prof. Dr.Chelvam Venkatesh, Associate Professor in the Department of Chemistry and Department of Bioscience and Biomedical Engineering at IIT Indore. Introduction of the speaker was given by Dr Sanjay Kumar Singh, Assistant Professor, Department of Chemistry, Govt. Babu College, Nowgong Dist. Chhatarpur, MP. In continuation of his previous lecture Dr.Venkatesh started his lecture by explaining classification of drugs. Further he discussed the "Angiotensin Converting Enzyme (ACE) Inhibitors". Dr. Chelvam extended his talk by explaining the role, advantages, function of working, mechanism and examples of ACE. He also explained how ACE is superior and safer than other regular drugs and how they are beneficial for the heart and kidney. Dr. Venkatesh also discussed the design and development of ACE and explained the synthesis and isolation of this enzyme. Dr. Venkatesh extended his talk with the explanation of how any drug will discover, design and developed by following four G's rule that is Luck, Patience, Skill and money. He discussed the different stages of drug discovery and development in detail from the target identification to FDA approval. He shared various examples of some bioactive natural products like Penicillin G, Taxol, Discodermolide etc. Dr. Venkatesh end up his talk by explaining importance of chirality in drug design process and sharing successful examples of some FDA approved drugs and derived from natural products or enzymes. Finally, the vote of the thanks was offered by Dr. Santosh Ranghnath Deshmukh, Assistant Professor, Ahmednagar College, Ahmednagar, (M.S.).

The screenshot shows a Zoom meeting interface. At the top, a notification states: "Recording has started. This meeting is being recorded. By joining, you are giving consent for this meeting to be recorded. Privacy policy". The main content is a slide titled "Drug Discovery, Design and Development". The slide lists "The four 'G's in successful drug discovery (by Paul Ehrlich): Glück, Geduld, Geschick, und Geld (luck, patience, skill and money)". It is divided into three sections: Discovery, Design, and Development, each with a list of key activities. A "Drug Discovery Pyramid" diagram is also present, showing the progression from Basic Research (10,000-10,000 Substances) through Preclinical Tests (10-20 Substances), Clinical Tests (Phase I, II, III), and finally to Product availability (Phase IV). The bottom of the screenshot shows the Zoom control bar with various icons and a list of participants: SADIK AHMED SHERK..., Bowajit Gopal Roy (G..., SWATI SINGH (Guest), and Chelvam Venkatesh.

**Dr.Chelvam Venkatesh Explaining Drug Discovery, Design and Development**

**Date: 14/01/2022; Time: 11:30 AM To 01:00 PM**

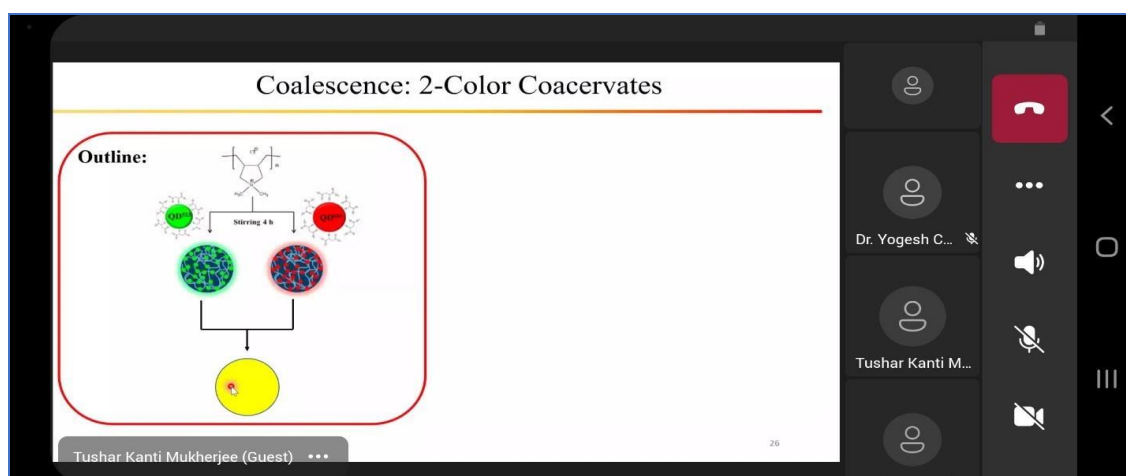
**Session: II**

**Resource Person:** Dr. Tushar Kanti Mukherjee, Associate Professor, IIT Indore



**Topic: Understanding and Exploring the optoelectronic Properties of Self-Assembled Hybrid Coacervate.**

In this session, Dr. Tushar Mukherjee, Associate Professor, Discipline of Chemistry, IIT Indore was the resource person. Dr. Dilip Kumar Singh, Assistant Professor, Bipin Bihari College, Jhansi coordinated the session and introduced the resource person. Dr. Tushar Mukherjee divided his talk into three parts i.e. Fabrication and Optoelectronic properties of Hybrid Coacervate Nanodroplets, Hybrid Nanodroplets as Catalytic Nanoreactors and Nanocarriers for Cargo Delivery. At the outset Dr. Mukherjee defined Optoelectronics, Self assembly, Coacervation, Synthetic condensates to organelles, intracellular condensates and complex coacervates. He elaborated the fabrication and optoelectronic properties of Hybrid Coacervate nanodroplets. After that he discussed Hybrid nanodroplets (ND) and catalytic nanoreactors. He explained Partitioning of Nitroarenes inside the nanodroplets, its reduction, photolytic conversion, catalytic role of embedded CDs, their stability and recyclability. He illustrated CD-embedded NDs provide unique micro environment to sequester a wild range of organic molecules. Most drugs are hydrophobic in nature and not solubilize inside the cellular environments to enhance the systemic circulation of drugs, so we need nanocarriers for drug delivery. At the end of the session, vote of thanks was proposed by Dr. Santosh Deshmukh Assistant Professor, Ahmednagar College, Ahmednagar, (M.S.). The session was very insightful.



**Dr. Tushar Kanti Mukherjee explaining Coacervates**

**Date: 14/01/2022; Time: 02:00 PM To 03:30 AM**

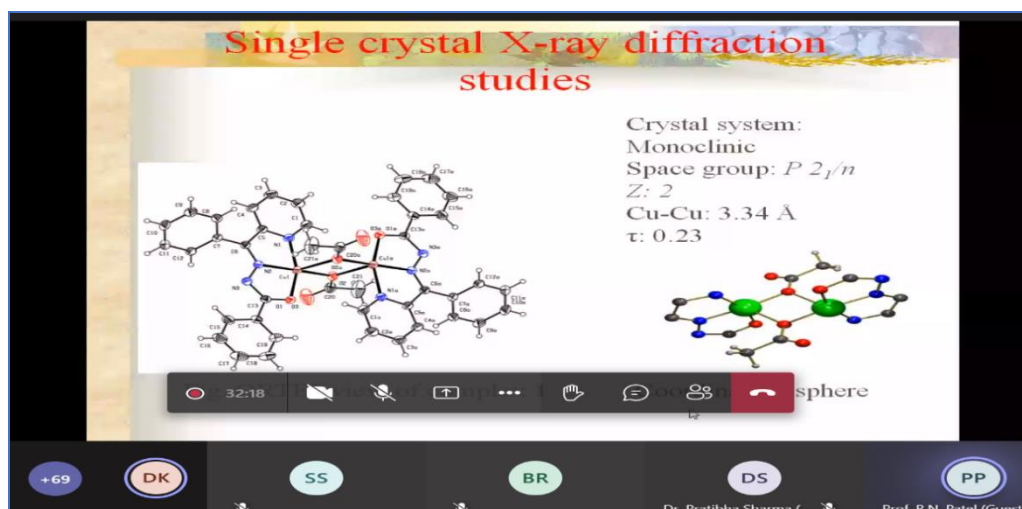
**Session: III**

**Resource Person:** Dr. R.N. Patel, Professor,  
Department of Chemistry, A.P.S. University, Rewa



**Topic: Synthesis and Characterization of Copper Complexes  
usin Electron Spin Resonance (ESR) Technique**

The Resource person for the post lunch session was Dr. R.N. Patel, Professor, Department of Chemistry, A.P.S. University, Rewa. The session began with the introduction of the resource person by Mr. Lokesh Jharbade, Assiatant Professor, Govt. College Amla, Betul. Dr. Patel began with the introduction of Electron Spin Resonance Spectroscopy (ESR). He gave an overview of the instrumentation of a typical ESR spectrometer. He also explained how the ESR spectrum is plotted. The ESR spectra of copper complexes and vanadyl Complexes were explained in detail. Further, a comparative study of the spectra of both i.e., vanadyl and copper complexes was outlined along with the application of ESR technique in various frontiers like structure determination, study of catalyst, determination of oxidation state of a metal etc . Also, biological applications of ESR were explained. Structural characterisation of Cu (II) complexes using ESR was illustrated. Complexes of copper with glycine and glycine-imidazole and their ESR spectra at variable pH were shown. ESR spectra in polycrystalline and solution form (DMSO) at low and room temperature were discussed. Dependency of ESR signal on pH under frozen conditions with respect to imidazolate bridged complexes was illustrated. Single crystal X-ray diffraction studies of monoclinic and triclinic binuclear copper systems were also mentioned.



**Dr. R. N. Patel explaining XRD studies**

**Date: 14/01/2022; Time: 03:30 PM To 05:00 PM**

**Session: IV**

**Resource Person:** Dr. R.N. Patel, Professor,  
Department of Chemistry, A.P.S. University, Rewa

**Topic: Synthesis and Characterization of Copper Complexes**

In the last session of the day the resource person Dr. R.N. Patel, Professor, Department of Chemistry, A.P.S. University, Rewa, delivered his talk on the topic Synthesis and characterization of Copper Complexes, their various synthetic schemes. He explained the condensation of benzoyl hydrazide with 2-benzoylpyridine and subsequent deprotonation leading to the formation of complex. Pi-pi stacking and p-pi stacking interactions of polynuclear complexes were discussed. To characterize the prepared copper complexes, U.V.-Visible spectral studies, low temperature (1.8 to 2 K obtained using liquid helium) magnetic studies, X-band ESR spectral studies of mononuclear species in polycrystalline and solvent (DMSO) form, cyclic voltammetry, Hirshfield Surface Analysis, single crystal XRD, and other techniques were used. Overall, both the sessions were extremely informative. The vote of thanks was proposed by Mr. Prashant Yawale, Assistant Professor, Govt. College, Chandur Bazar, Amrawati (M.S.).

The screenshot shows a presentation slide titled "Proportionality Factor". On the right side of the slide is a graph of a derivative ESR signal with a central peak and trough, and a vertical dashed red line labeled 'g' indicating the center of the signal. On the left side, there is a bulleted list:

- Measured from the center of the signal
- For a free electron
  - 2.00232
- For organic radicals
  - Typically close to free-electron value
  - 1.99-2.01
- For transition metal compounds
  - Large variations due to spin-orbit coupling and zero-field splitting
  - 1.7-2.0

At the bottom of the slide, there is a video conference control bar with icons for mute, video, chat, and call. Below the control bar is a row of participant initials: A, KN, DN, DS, DS, DC, SS, PP, LJ, DS, AS. The name "Prof. R.N. Patel (Guest)" is visible under the "PP" icon.

**Dr. R. N. Patel explaining Proportionality Factor**



**Day 05; Date: 15/01/2022; Time: 10:00 AM To 11:30 AM**

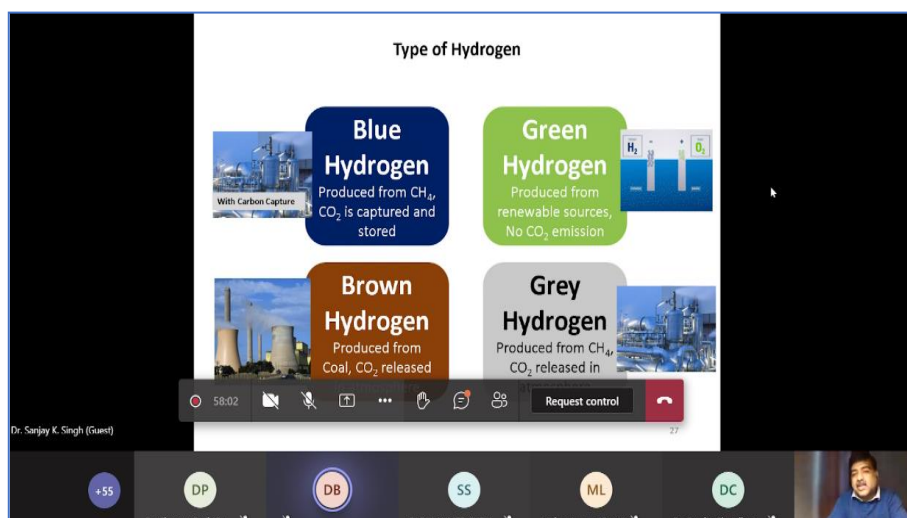
**Session: I**

**Resource Person:** Dr. Sanjay K. Singh,  
Discipline of Chemistry, IIT Indore



**Topic: Hydrogen as a clean fuel**

In the first session of fifth day of refresher course, Dr. Sanjay K. Singh, Associate Professor, Discipline of Chemistry, IIT Indore was the resource person. Dr. Yogesh Patil, Assistant Professor, Department of Chemistry, Art's commerce and science college, Onde Tal Vikramgad dist. Palghar (M.S.) coordinated the session and introduced the resource person to the participants. Initially Dr. Sanjay K. Singh discussed about the problem of global CO<sub>2</sub> emission, carbon footprint and global warming. He stated that worldwide CO<sub>2</sub> levels must be reduced by 70% to keep global temperatures below 20°C, necessitating the quest for a more sustainable and efficient energy system. He added that hydrogen is well-balanced with efficient energy content for carbon-free transportation to meet global energy demand while reducing oil reliance, greenhouse gas emissions, and air pollution. He stated that hydrogen is the future's clean fuel. Brown, Grey, Blue, and Green Hydrogen are the four basic varieties of hydrogen based on the production technique and carbon concentration. He talked about liquid hydrogen storage materials for green hydrogen production, which are organic compounds that can absorb and release hydrogen chemical reactions, usually with the intervention of a catalyst. Methanol, ethanol, hydrazine, formaldehyde, formic acid, ethylene glycol, and other liquid organic carriers are examples. Ni/Pt nanocatalysts were also used to



create hydrogen from hydrous hydrazine. Dr. Singh concluded his presentation by discussing the creation of hydrogen from PET waste. Dr. S. S. Ubarhande, Assistant Professor,

G.S. Tompe Arts, Commerce and Science College, Chandur Bazar, Dist. Amravati, (M.S.) proposed a vote of gratitude at the end. The discussion was both intriguing and scholarly.

Date: 15/01/2022; Time: 11:30 AM To 1:00 PM

Session: II

Resource Person: Dr. Deepak K. Roy, Professor, Discipline of Chemistry, IIT Indore



Topic: Various Aspects of Boron Chemistry.

In this session, Dr. Deepak K. Roy, Professor, Discipline of Chemistry, IIT Indore was the resource person. Dr. Yogesh K. Patil, Assistant Professor, Department of Chemistry, Art's commerce and science college, Onde Tal Vikramgad dist. Palghar (M.S.) coordinated the session and introduced the resource person. Dr. Deepak K. Roy started his talk with the basic properties of Boron which makes it special element. He discussed the different compounds of Boron viz Boron compounds without Transition metals and Transition metal Boron complexes and uses of these in daily life. After that he discussed about isolation of Boron and Preparing Boron from Borax. He elaborated industrially important boron compounds. He explained methods of preparation, properties and uses of Sodium perborate, Orthoboric acid, Boron trioxide, Boron Carbide, Boron halides and Boron hydrides. He explained STYX Notation, Wades rules and Jemmis (mno) rule with examples. Finally, he elaborated Carbyne and Metalloborane Synthesis and their reactivity. At the end of the session, a vote of thanks was proposed by Mr. Billorsingh Senani, Assistant Professor, Govt. College Sanawad Dist. Khargone (M.P.). The session was very informative.

**Carborane Superacids**

The carborane superacid  $\text{H}(\text{CHB}_{10}\text{Cl}_{11})$  is **one million times stronger** than sulfuric acid. The reason for this high acidity is that the acid anion  $\text{CHB}_{10}\text{Cl}_{11}^-$  is very stable and substituted with electronegative substituents.  $\text{H}(\text{CHB}_{10}\text{Cl}_{11})$  and related carborane acids are known to protonate  $\text{C}_{60}$  fullerene without decomposing it. Additionally, it is the only known anion capable of forming a stable, isolable salt with protonated benzene,  $\text{C}_6\text{H}_7^+$ .

$\text{CHB}_{10}\text{Cl}_{11}^-$

Acid	$\Delta\text{H}^\circ$ (°C) [ppm]	$\text{H}_2$
$\text{H}(\text{CHB}_{10}\text{Cl}_{11})$	$84.0 \pm 0.1$	H
$\text{H}(\text{CHB}_{10}\text{H}_2\text{Cl}_9)$	$83.8 \pm 0.1$	H
$\text{H}(\text{CHB}_{10}\text{H}_4\text{Br}_6)$	$83.8 \pm 0.1$	H
$\text{H}(\text{CHB}_{10}\text{H}_6\text{F}_4)$	$83.3 \pm 0.1$	H
$\text{FSO}_3\text{H}$	$73.8 \pm 0.5$	-15.1
$\text{CF}_3\text{SO}_3\text{H}$	$72.9 \pm 0.4$	-14.1
$\text{HN}(\text{SO}_2\text{CF}_3)_2$	$72.0 \pm 0.4$	H
$\text{H}_2\text{SO}_4$	$64.3 \pm 1.0^{\text{[a]}}$	-12.1
Unprotonated mesityl oxide	$32.4 \pm 0.1$	

[a]  $\text{H}_2$  values unavailable because acids are solids, not liquids; [b] Incomplete miscibility of  $\text{H}_2\text{SO}_4$  in liquid  $\text{SO}_2$  leads to higher error limits and possible underestimates of  $\Delta\text{H}^\circ$ .

**Olah Magic Acid ( $\text{FSO}_3\text{H-SbF}_5$ )**

The compound, called a carborane acid, is the first "superacid" that can be stored in a bottle, say its creators. The previous record-holder, fluoroantimonic acid, is so corrosive that it would eat straight through the glass.

The Strongest Isolable Acid  
Christopher A. Reed et al, Angew. Chem.Int. Ed. 2004, 43, 5352

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Dr. Deepak K. Roy Explaining about Carborane Superacids

**Date: 15/01/2022; Time: 02:00 PM To 03:30 PM**

**Session: III**

**Resource Person:** Dr. Ashu Rani, Professor,  
Department of Chemistry, University of Kota (Rajasthan)



**Topic: Heterogeneous catalysts from Coal Waste Fly Ash**

The session began with the introduction of the resource person by Dr. Chetna Patil, Assistant Professor, Department of Chemistry, Art's commerce and science college, Onda Tal Vikramgad dist. Palghar(M.S.). The resource person Dr. Ashu Rani, Department of Chemistry, University of Kota (Rajasthan) started her talk with the introduction of the concept of catalyst. Few distinct points were discussed related to the importance of catalyst in a chemical reaction. Disadvantages of homogeneous catalysts and advantages of heterogeneous catalysts were elaborated. Various supporting materials like silica, polymers were explained with respect to their compatible heterogeneous acid catalysts. Further, their application and characteristics were discussed. Microwave assisted

**Heterogeneous Catalyst**  
Solid Acid, Solid Base, Oxidation, Photo-catalytic, Photo-oxidation, Supported ionic liquids etc.

**Desired Characteristics**

- High activity
- Stable, Robust, Appropriate pore volume and size distribution
- High surface to volume ratio
- Low complexity of preparation
- Cost effective

**Advantages :**

- Non-corrosive
- Easily separated from reaction mixture
- Required in small catalytic amount

20:19

SK DS LC PR

prof Ashu Rani (Guest)

heterogeneous acid catalysts were also listed. Types of solid base catalyst like single metal oxide, mixed metal oxides were explained and their applications were mentioned. Further, resource person explained about her active research work in synthesis, characterisation and applications of recyclable solid catalyst from coal generated solid waste namely fly ash, volcanic ash and lime stone slurry. She explained in detail about each of

the three. Classification of fly ash and its properties was mentioned in brief. Detailed explanation about perlite (volcanic ash) composition and properties was also provided. Different features of all these catalysts were explained very well using flow charts wherever possible. Activation techniques such as thermal, mechanical and chemical were discussed. Applications and characterisation via SEM, IR and XRD of various fly ash catalysts like Ni-Co/FA, Vanadyl/FA, CaO/FA were discussed. Finally, the recyclability and reusability of the catalyst was emphasized. Overall, the session was very informative.

**Date: 15/01/2022; Time: 03:30 PM To 05:00 PM**

**Session: IV**

**Resource Person:** Dr. Ashu Rani, Professor,  
Department of Chemistry, University of Kota (Rajasthan)

**Topic: Ethics Considerations in Academia and Research**

The distinguished speaker of fourth session was Dr. Ashu Rani, Professor, Department of Chemistry, University of Kota (Rajasthan). Prof. Rani has started her lecture by discussing the demands of New Education Policy 2020 and requirement of sustainable and transparent academic and research system in academic institutions. Further she has discussed various areas of academic misconduct including: plagiarism, fabrication and falsification, faulty data gathering, poor data storage and sneaky publication practice etc. Prof. Rani extended her talk by explaining the technology related ethical issues in academic institutions that is called e-Ethics. Further she has discussed the effects of scientific misconduct on a one's career by fake studies, fake results, fake journals and fake conferences. Prof. Rani has shared a graphical representation of honest errors that results retracted papers. She has explained it very beautifully with the great explanation. Further she discussed about research dissemination, intellectual property rights and importance of research policies. Then she had a detailed discussion on plagiarism, plagiarism network, types of plagiarism and identification of plagiarism. She has also presented an account of various techniques for the detection and prevention for plagiarism. Finally, she has shared



various tools and software which are using to detect or check plagiarism in different universities and institutions for example: PlagScan, Plagware, iThenticate, Shodhshudhi, Plagtracker, Turnitin and many more. At the last Prof. Rani has concluded the session by enlightening

the requirement of development of new plagiarism detection techniques and intellectual property source codes etc. The vote of thanks was offered by Mr. Daniel Prasad, Assistant Professor, Govt. Chandra Vijay College, Dindori (M.P.).

**Day 06; Date: 17/01/2022; Time: 10:00 AM To 11:30 AM**

**Session: I**

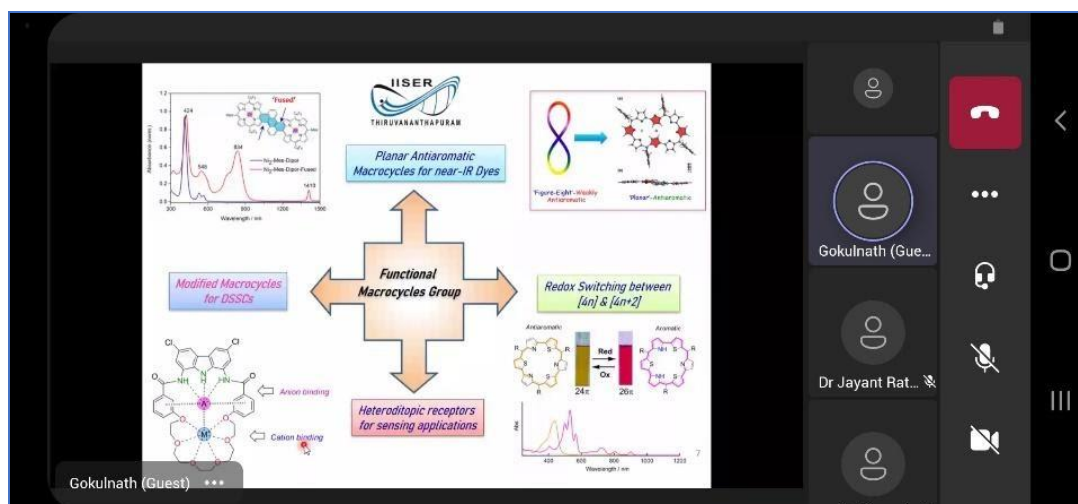
**Resource Person: Dr. S. Gokulnath,**

School of Chemistry, IISER, Thiruvananthapuram



**Topic: Various Synthetic Strategies Towards Functional Macrocyces and their optical and conformational Properties.**

In the first session, Dr. S. Gokulnath, from School of Chemistry, IISER, Thiruvananthapuram was the resource person. Dr. Jayant Rathod, Assistant Professor, Govt. Science College, Dhanpur (Gujarat) coordinated the session and introduced the resource person. Dr. S. Gokulnath initially defined 'Functional Macrocyces Group and about Planar Antiaromatic Macrocyces for near IR Dyes', Redox switching between  $4n$  and  $4n+2$  Heteroditopic receptors for sensing applications and Modified Macrocyces for DSSCs. He discussed Porphyrin and its structural modification. He elaborated the Structural characterization of expanded porphyrinoids. Magnetic criteria for antiaromaticity and strategies towards planar conjugated macrocyclic systems are also explained by him. After that he discussed Reversible redox interconversion between huckel  $4n$  and  $(4n+2)\pi$  and their spectra. He explained Aromaticity and stability relation. He also explained Synthetic strategy for carbazole embedded porphyrin like macrocyces and their steady state measurements of porphyrin. At the last part of talk he discussed broad class of sensitizers. At the end of the session, a vote of thanks was proposed by Ms. Lalita Singh, Assistant Professor, Govt. College Deosar, Singrauli (M.P.). The session was very informative and insightful.



**Dr. S. Gokulnath explaining Functional Macrocylic group**

**Date: 17/01/2022; Time: 11:30 AM To 1:00 PM**

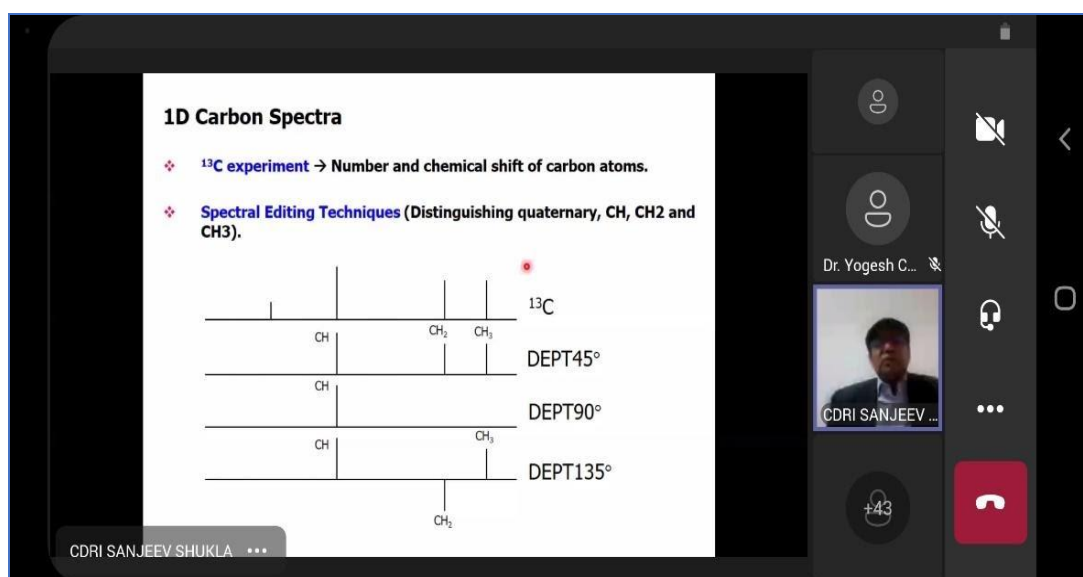
**Session: II**

**Resource Person:** Dr. S. K. Shukla, Principal Scientist, CSIR-CDRI, Lucknow



**Topic: Basics and Applications of NMR Spectroscopy.**

The session began with the introduction of the resource person Dr. S. K. Shukla, Principal Scientist, CSIR-CDRI, Lucknow by Dr. Udaysingh Patel, Assistant Professor, Assistant Professor, Dayanand Anglo-Vedic PG College, Kanpur. Dr. Shukla started his talk with explaining General Principle of Spectroscopy and Molecular quantized energy levels. He elaborated the typical applications of NMR like Structural elucidation, study of dynamic processes Structural 3D studies, drug design and NMR in medical science. After that he discussed NMR spectrometer working principle and its advancement on the basis of sensitivity, resolution and type of experiment with basic concept of electromagnetic theory. He explained Basic 1D NMR experiment, Fourier Transform and spin relaxation. Chemical shift data, Relative intensity of Peaks, NMR Scalar and Dipolar Coupling, signal splitting, coupling constants are also explained by him. He compared the proton NMR and  $^{13}\text{C}$  NMR and their differences. C-13 chemical shift, C-13 spin-spin coupling and some C-13 spectra were also explained by him. At the end of the session, vote of thanks was proposed by Ms. Kavita Nagar, Assistant Professor, Govt. College Jaitpur, Dist. Shahdol (M.P.). The session was very informative and useful for teaching and research points of view..



**1D Carbon Spectra**

- $^{13}\text{C}$  experiment → Number and chemical shift of carbon atoms.
- Spectral Editing Techniques (Distinguishing quaternary, CH, CH<sub>2</sub> and CH<sub>3</sub>).

The slide shows a chemical structure with four carbon atoms labeled CH, CH<sub>2</sub>, and CH<sub>3</sub>. Below it are four NMR spectra:  $^{13}\text{C}$ , DEPT45°, DEPT90°, and DEPT135°. The DEPT spectra show the distinction between CH, CH<sub>2</sub>, and CH<sub>3</sub> groups.

**Dr. S. K. Shukla explaining 1D Carbon spectra**

**Date: 17/01/2022; Time: 02:00 PM To 3:30 PM**

**Session: III**

**Resource Person:** Dr. H.P.S. Chauhan, Professor, School of Chemical Sciences, Devi Ahilya University, Indore (M.P.)



**Topic: Some Metal- Metal multiple bonded Metal Clusters**

The session began with the introduction of the resource person by Dr. Ranjeet Singh Chauhan, Assistant Professor, Gochar Mahavidyalaya, Rampur. The resource person Dr. H.P.S. Chauhan, School of Chemical Sciences, Devi Ahilya University, Indore (M.P.), started his talk with the introduction of the concept of metal clusters. The metal clusters of various types were discussed in detail. Dinuclear complexes of the type  $M_2X_8$  were explained using the example of Rhenium complexes. The unusual features of these clusters like short metal-metal bond distance and eclipsed configuration of ligands were also mentioned. The orbital overlap, Molecular orbital arrangement, metal-metal bond length, metal -ligand bond length, various types of bonds especially the quadrupole type were elaborated in detail. Similar studies were also depicted for Molybdenum complexes. Other type of complexes like trinuclear, tetranuclear, quintuple, hexanuclear, polyatomic zintl anions and cations, chevre phases and infinite metal chains were also discussed. The delta type bonding was explained very well using apt diagrammatic representation. For most of the clusters involving rhenium, molybdenum, chromium and copper; orbital interaction diagram, structure depicting orbital orientation, molecular orbital diagram was presented explicitly well. At the end of the session, vote of thanks was proposed by Dr. Satyaprakash Verma, Assistant Professor, Govt. College Jaitpur. Dist. Shahdol

**Dinuclear clusters**

The best studied dinuclear clusters are  $[Re_2X_8]^{2-}$  ions. These may be prepared by reduction of  $[ReO_4]^-$  (Perrhenate ion) with  $H_2$ ,  $H_3PO_2$  or  $PhCOCl$  in the presence of  $X^-$ .

$$2[ReO_4]^- + HX; H_3PO_2; PhCOCl \longrightarrow [Re_2X_8]^{2-} \quad [X = F, Cl, Br, I, NCS]$$

A similar type of diamagnetic red ion complex  $[Mo_2Cl_8]^{4-}$  is obtained by the reaction of conc. HCl and molybdenum acetate at  $0^\circ C$ .

$$2Mo(acac)_2 + Conc. HCl \xrightarrow{0^\circ C} [Mo_2Cl_8]^{4-}$$

By now such  $[M_2Cl_8]$  complexes are known for Cr(II), Mn(III), Fe(III) and Ti(III)

**Dr. H.P.S. Chauhan explaining the Dinuclear Complexes**

**Date: 17/01/2022; Time: 03:30 PM To 05:00 PM**

**Session: IV**

**Resource Person:** Dr. Uma Sharma, Professor, School of Studies in Chemistry and Biochemistry, Vikram University, Ujjain (M.P.)



**Topic: Photoelectron Spectroscopy (PES)**

The distinguished speaker of the fourth session of the day was Dr. Uma Sharma, Professor, School of Studies in Chemistry and Biochemistry, Vikram University, Ujjain (M.P.). Introduction of the speaker has been presented by Dr Reena Gami, Assistant Professor, Rajiv Gandhi Government PG college, Mandsaur (M.P.). Prof. Sharma has started her lecture by explaining principle of photoelectron spectroscopy. Further she has discussed the Electromagnetic spectrum, different spectroscopy techniques and historic background of different spectroscopic techniques. She has also explained how the photoelectron spectroscopy is different from other spectroscopy. Prof. Sharma extended her talk by explaining the photoelectric effect and how it works. She has also explained X-ray fluorescence and Auger process and surface analysis techniques. Prof. Sharma has shared and discussed the photoelectron spectrum of CO<sub>2</sub>, N<sub>2</sub>O and other molecules. Prof. Sharma also explained about the interpretation and factors affecting therein considering binding energy shifts, chemical shifts, electromagnetic effects etc. Further she has discussed various applications and importance of PES e.g., XPS analysis of pigment from mummy artwork, analysis of carbon fiber-polymer composite material by XPS, analysis of materials for solar energy collection by XPs depth profiling. Finally, the vote of the thanks was offered by Dr. M. Ganapathi, Assistant Professor, Vivekananda college, Tiruvedakam, Madurai, Tamil Nadu.



**Dr. Uma Sharma explaining Analysis of Materials for Solar Energy Collection**



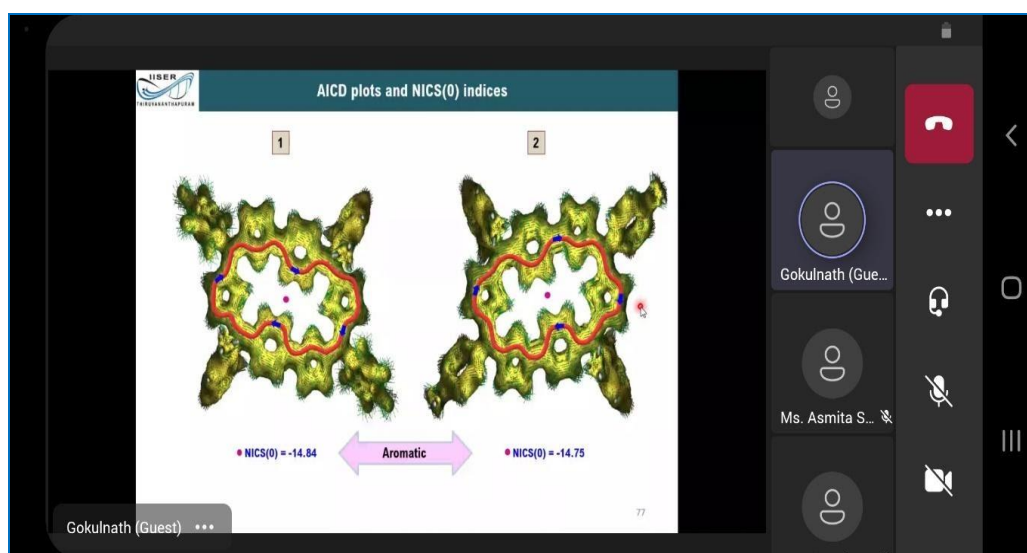
**Day 07; Date: 18/01/2022; Time: 10:00 AM To 11:30 AM**

**Session: I**

**Resource Person:** Dr. S. Gokulnath,  
School of Chemistry, IISER, Thiruvananthapuram

**Topic: Facile Formation of various cyclic- BODIPYs and their Structure Property.**

The first session of the day began with the introduction of the resource person by Dr. Naveen Awasthi, Assistant Professor, Janta College Bakhewar, Etawah (U.P.). Dr. S. Gokulnath, School of Chemistry, IISER, Thiruvananthapuram, began his session with discussing the building blocks of porphyrins, which he had explored in his previous lecture. He thrown light on the literature survey of [24]Rubyrin, the diprotonated macrocycle binds to chlorine and phosphate ions in a non-labile manner and about Ppyrurubin (1.1.0.1.1.0). He explained their synthetic strategy, NMR characterization, single crystal X-ray structure. After that he discussed acyclic and cyclic BODIPYs, Synthesis of pyridine linked macrocyclic tris-BODIPY and its C60 fullerene complexation. He also explained phenylene incorporated decaphyrins, carbazole embedded hexaphyrin like macrocycle its synthetic strategy and optical properties. Dr.Gokulnath wrapped off his presentation by answering questions from the audience. At the end of the session, a vote of thanks was proposed by Dr.Laveena Paul Chouhan, Assistant Professor, SCA Govt. PG College Jhabua (M.P.). The session was very informative.



**Dr. S. Gokulnath Explaining AICD plots and NICS Indices**

**Date: 18/01/2022; Time: 11:30 AM To 1:00 PM**

**Session: II**

**Resource Person:** Dr. A. G. Fadnis, Retired Principal, Govt. College, Harsud (M.P.)



**Topic: Detection of free radicals using Electron Spin /Paramagnetic Resonance Spectroscopy.**

In this session, Dr. A. G. Fadnis, Retired Principal, Govt. College, Harsud was the resource person. Dr. Parsuram Maske, Assistant Professor, Department of Chemistry, Art's commerce and science college, Onde Tal Vikramgad dist. Palghar (M.S.) introduced the resource person to the participants. Dr. A. G. Fadnis explained that electron spin resonance (ESR) spectroscopy, also known as electron paramagnetic resonance (EPR) spectroscopy, is a versatile, nondestructive analytical technique that can be used for a variety of applications in biology, medicine, and physics, including oxidation and reduction processes, biradicals and triplet state molecules, reaction kinetics, and many more. He contrasted ESR with NMR spectroscopy, explaining that because NMR spectroscopy does not always produce meaningful spectra for paramagnetic materials, EPR spectroscopy can provide extra information. Analysis of the coupling patterns can provide information about the number and type of nuclei coupled to the electrons. He explained that how Interpretation of EPR spectrum is done from the central position of lines (signal) which is used for calculating characteristics "g" value of radical/paramagnetic species with reference to standard DPPH. He discussed Spin Trapping, as a technique in which a short-lived reactive free radical (Ro) combines with a diamagnetic molecule ("spin trap") to form a more stable free radical ("radical adduct") which can be detected by electron spin resonance. The two major classes of spin traps nitrones and nitroso compounds are used for the detection of transient short lived free radicals. If compound of interest does not have an unpaired electron then it is attached by chemical reaction to a compound (spin label) that has unpaired electrons to record its ESR spectrum At the last part of talk he shared his work experience with ESR. At the end of the session, a vote of thanks was proposed by Dr. Mithun Lunge, Assistant Professor, Jagdamba Mahavidyalaya, Achalpur (M.S.). The session was thoughtful and very informative.

**Date: 18/01/, 2022; Time: 2.00 PM to 3.30 PM**

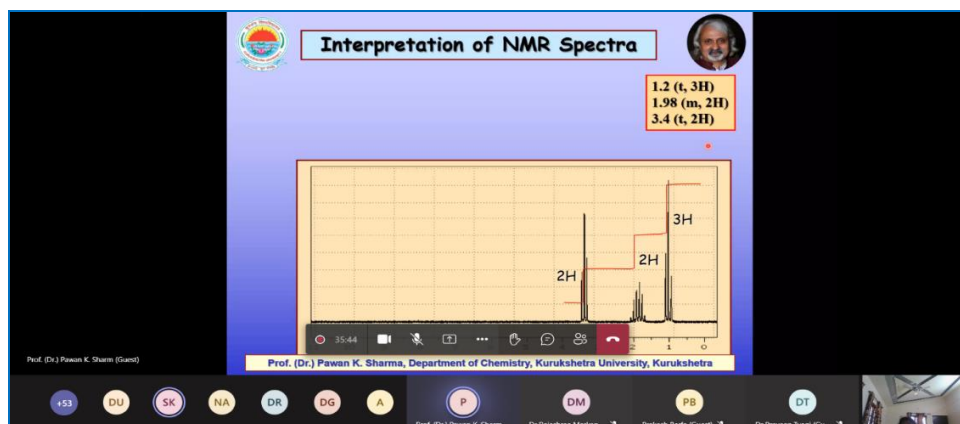
**Sessions: III**

**Resource Person:** Dr. Pawan K. Sharma, Professor, Department of Chemistry, Kurukshetra University, Kurukshetra



**Topic: 2D NMR as a tool for Structure Elucidation**

The session began with the introduction of the resource person by Dr. Rajashree Ajay Markandewar, Assistant Professor in Chemistry, Rashtrapita Mahatma Gandhi Arts, Commerce and Science College, Saoli, District Chandrapur, Maharashtra. The resource person, Dr. Pawan K. Sharma, Kurukshetra University, Kurukshetra; began with the introduction of 2D techniques for structure elucidation. He explained as how to interpret the  $^1\text{H-NMR}$  spectrum for simple compounds. He then continued with the 2D techniques. First part involved the COSY (Correlation Spectroscopy) technique for homonuclear systems, followed by the DQF-COSY (Double Quantum Filtered COSY) and then TOCSY (Total Correlation Spectroscopy). He explained all the three techniques very well using several apt examples. He also mentioned the conditions under which either one or two or all three of these techniques would have to be adopted so as to study the structure of an unknown compound. He also introduced a 1D technique of  $^{13}\text{C-NMR}$ , i.e., DEPT (Distortion less Enhancement by Polarisation Transfer). He explained very well about the advantages of DEPT spectrum over the other coupled and fully decoupled spectra  $^{13}\text{C-NMR}$  spectra. He also illustrated how fully decoupled spectra, DEPT-135, DEPT-90 may be studied comparatively so as to obtain information about the number of mono-, di-, tri- and tetra-substituted carbons. The complicated techniques were simplified exceptionally well such that even an amateur learner of spectroscopic techniques would benefitted from the session.



**The resource person, Dr. Pawan K. Sharma, explaining the interpretation of NMR**

**Date: 18/01/2022; Time: 03:30 PM To 05:00 PM**

**Session: IV**

**Resource Person:** Dr. Pawan K. Sharma, Professor, Department of Chemistry, Kurukshetra University, Kurukshetra

**Topic: 2D NMR as a tool for structure elucidation.**

The last session of day seven of the refresher course in Chemistry, has loaded with tremendous knowledge and great vitality. The session has started with the wonderful and mind-blowing talk of eminent speaker, Dr. Pawan K. Sharma, Professor, Kurukshetra University, Kurukshetra. In continuation of his previous lecture, Prof. Sharma has discussed advantages of HSQC (Heteronuclear Single Quantum Coherence) technique, which is used to determine proton carbon single bond correlations. He has shared HSQC spectrums of various compounds and explained the detailed information for the same. He also shared complete description of HSQC-TOCY and HMBC spectrums and explained how 2 bond 3 bond correlation between carbon and hydrogen in a molecule take place and with the help of HMBC and HSQC spectrum how can one identify 4 carbon spin and 2 carbon spin systems. Prof. Sharma extended his talk with discussing the 2D NIOSY spectrum and shared various examples of it. With the help of spectrums, he explained how all the H atom correlates with other atoms in the molecule and how cross peaks appears. Further the 1D NIOSY spectrum and INADEQUATE technique. Prof. Sharma ended his talk by explaining applications of aforesaid techniques. The vote of thanks was offered by Ms. Mitisha Baid, Assistant Professor, Govt. Nagarjuna PG College of Science Raipur, Chhattisgarh.



**Dr. Pawan K. Sharma, explaining HSQC - TOCSY**

**Day 08; Date: 19/01/2022; Time: 10:00 AM To 11:30 AM**

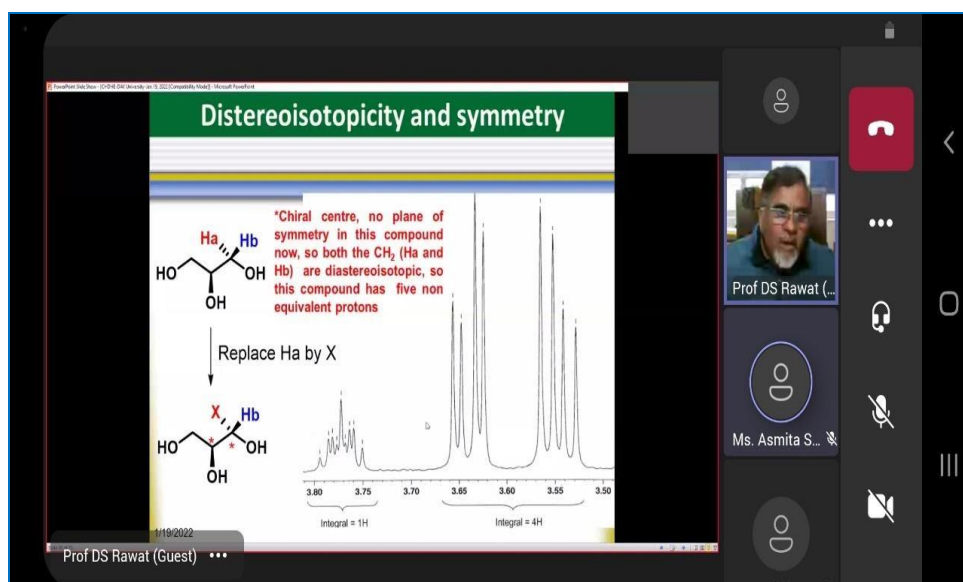
**Session: I**

**Resource Person:** Dr. Diwan S. Rawat, Professor,  
Department of Chemistry, University of Delhi, Delhi



**Topic: NMR Spectroscopy: Basic introduction to structure determination.**

In the first session, Dr. Diwan S. Rawat, Professor, Department of Chemistry, University of Delhi, was the resource person. Dr. S. Shaheeda Parveen, Assistant Professor, M.S.S. Wakf Board College, Madurai, Tamil Nadu, coordinated the session and introduced the resource person. At the outset Dr. D. S. Rawat discussed that why the structure and stereochemistry of compound is so important. He explained the importance of stereochemistry with the example of thalidomide and maitotoxin. Then he discussed the history of NMR spectroscopy and related Noble prizes. He elaborated all the basic concepts of NMR spectroscopy like spin of nucleus, magnetic moment, spin energies, Resonance, chemical shift, spin spin coupling etc. Further Dr. Rawat explained the effect of certain parameters like electronegativity, % S character (Hybridization of C atom) on chemical shift. After that he discussed Temperature dependent NMR, steric hinderance, concept of topicity, enantiotopicity, distereotopicity with examples of systematic substitution test. At the last part of this session he explained distereotopicity in isopropyl system. The session was very informative and engaging.



**Dr. Diwan S. Rawat explaining Distereotopicity and symmetry**

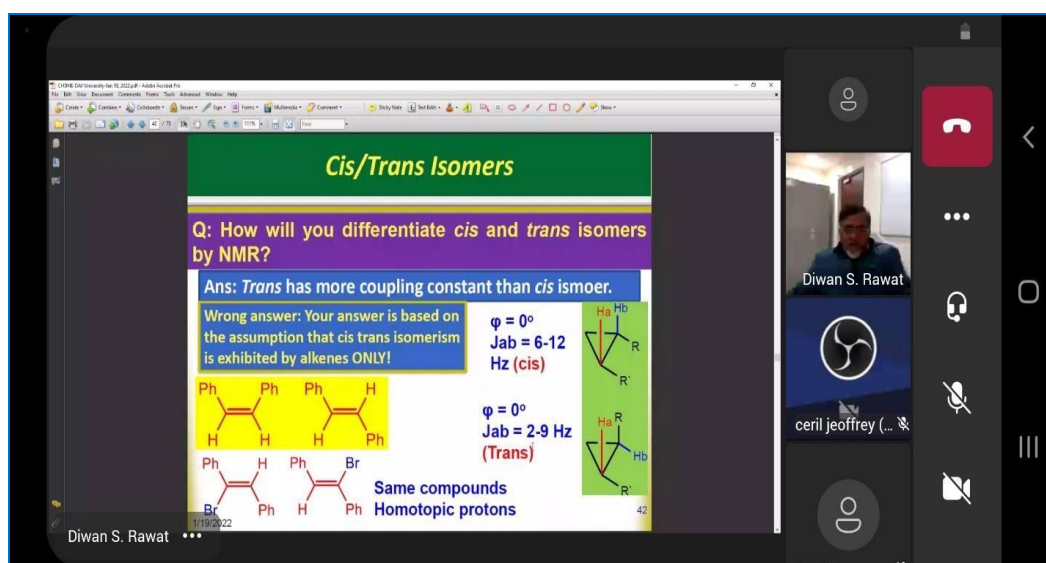
**Date: 19/01/2022; Time: 11:30 AM To 1:00 PM**

**Session: II**

**Resource Person:** Dr. Diwan S. Rawat, Professor,  
Department of Chemistry, University of Delhi

**Topic: NMR Spectroscopy: Basic introduction to structure determination.**

In this session, Dr. Diwan S. Rawat, Professor, Department of Chemistry, University of Delhi, Delhi was the resource person. Dr. S. Shaheeda Parveen again welcomed the resource person. In continuation of his first lecture Dr. Diwan S. Rawat started his talk with explaining Magnetic non-equivalence, that magnetic non-equivalence will always give second order spectra. He elaborated the non-equivalent protons and number of signals concept by giving many examples and cleared many confusions related to same. He next went through coupling in the context of homotopic, enantiotopic, and distereotopic protons. He explained relationship between coupling constant and dihedral angle i.e. Karplus Equation. Relative intensity of Peaks, signal splitting, coupling constants were also explained by him. He compared the NMR spectra of Cis-trans isomer, difference between double doublet and a quartet. He went over several spectral issues from previous CSIR-NET exams, including entire structure elucidation, thus this appeared to be a hands-on session. Using Rule of 13 he narrated how to calculate molecular formulae of unknown compound having hetero atom other than C and H. Dr. Rawat's lectures were both incredibly instructive and insightful. Dr. Abhishek Upadhyay, B.S.N.V. PG College, University of Lucknow, Lucknow, moved a vote of gratitude at the conclusion of the session.



**Dr. Diwan S. Rawat comparing NMR data of cis-trans isomers**

**Date: 19/01/2022; Time: 02:00 PM To 02:30 PM**

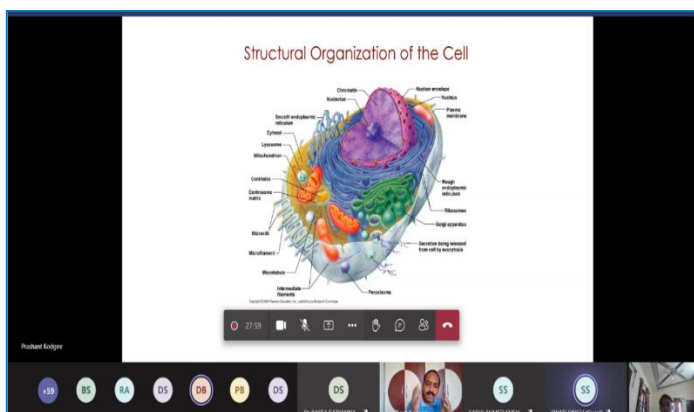
**Session: II**

**Resource Person:** Dr. Prashant Kodgire, Associate Professor and Ramanujan Fellow, Centre for Biosciences and Biomedical Engineering, IIT Indore.



**Topic: Molecules of Life and Central Dogma of Molecular Biology.**

The session began with the introduction of the resource person by Ms. Asmita Sandesh Naik Gaonkar, Assistant Professor, Govt. College of Arts, Science and Commerce, Quepem-Goa. The resource person, Dr. Prashant Kodgire, Associate Professor and Ramanujan Fellow, Centre for Biosciences and Biomedical Engineering, IIT Indore; began with the introduction of structural organization of the cell. The different parts of the cell and



its functions were explained in brief. Concept of Heredity and Mendelian Genetics were presented in an appropriate manner. Research paper related to the one of the major milestones in biological research i.e., Watson and Crick Model of DNA was shown. The analogy of genetics

to a book which may be called as Genetic Book of Life wherein Genome is a Book, chromosome is a chapter, Genes are sentences, words are codons and letters are base-pairs was indeed interesting. Central Dogma of molecular biology i.e., DNA transcription to RNA and then translation to proteins was shown using interesting diagram. Here, he also emphasized on the reverse transcription i.e., from RNA to DNA which may occur in case viruses. Also, Meselson-Stahl Experiment which confirmed semiconservative replication was also shown using diagrammatic representation. Further, the concept of splicing, gene regulation and different types of chromatins were discussed. He explained very well how life which begins from a single cell thereby resulting in similar genetic material of all the human cells in different parts of the body. But, these cells in different organs perform different functions due to epigenetic regulation. Overall, it was an informative lecture. The session was concluded with the vote of thanks proposed by Dr. Sachin Borse, Assistant Professor, S.V.U. Patil Arts and Late Dr. B.S. Desale Science College, Sakri, Tal-Sakri, District Dhule, Maharashtra.

**Date: 19/01/2022; Time: 03:30 PM To 05:00 PM**

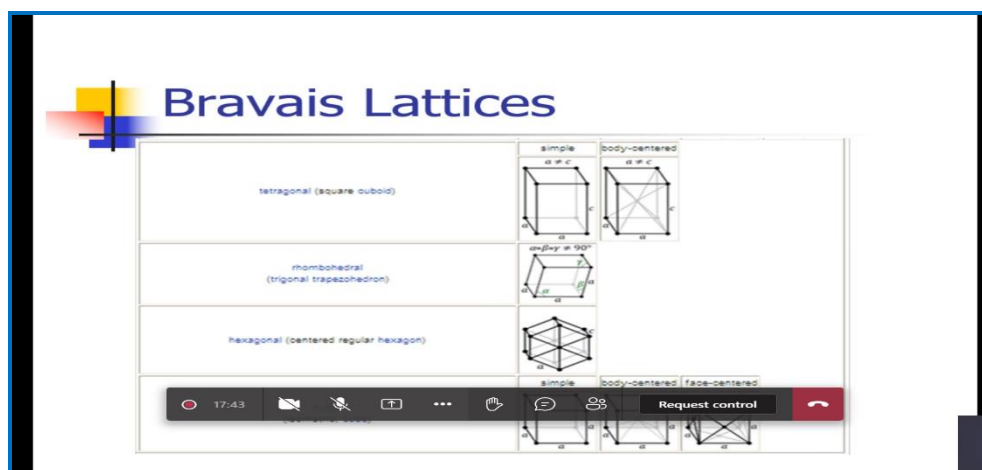
**Session: IV**

**Resource Person:** Dr. Shaikh M. Mobin, Associate Professor,  
Department of Chemistry, IIT, Indore



**Topic: X- ray crystallography: A basic Overview and Some Solid State Structural Transformation.**

The fourth session of day 7 of the refresher course in Chemistry was started with the wonderful and fantastic talk of the distinguished resource person, Dr. Shaikh M. Mobin, Associate Professor, Department of Chemistry, IIT, Indore. The introduction of the speaker was presented by Dr. Biswajit Gopal Roy, Department of Chemistry, Sikkim University, Gangtok, Sikkim. Dr.Mobin has started his lecture by explaining basics of crystallography i.e., what are crystals ?, various examples of crystals, lattice parameters and crystal systems. He explained the history and discovery of X-rays, their properties and general characteristics of these radiations. Further Dr.Mobin extended his talk by explaining how these radiations have been generated from the sealed X-ray tube and how these radiations interacted with the matters. He has also shared the phenomenon of X-ray diffraction through crystals and various diffraction patterns. Further in the second part of his discussion Dr.Mobin has discussed Single Crystal to Single Crystal (SCSC) transformations in discrete complexes and various types of SCSC methods.He has also explained synthesis of various crystals. Finally, Dr. Mobin has shared his research findings, that how he has designed various crystals by following different methods and what are the challenges encountered in the area of SCSC. The vote of thanks was presented by Dr. Urmila Raghuvanshi, Assistant Professor, Department of Applied Chemistry, Shri G S Institute of Technology and Science, Indore.



**Dr. Shaikh M. Mobin discussing Bravais Lattices**



**Day 09; Date: 20/01/2022; Time: 10:00 AM To 11:30 AM**

**Session: I**

**Resource Person:** Dr. Shaikh M. Mobin, Associate Professor, Department of Chemistry, IIT, Indore

**Topic: Recent trends in BIO-SENSORS and Bioelectronics.**

In the first session, Dr. Shaikh M. Mobin, Associate Professor, Department of Chemistry, IIT, Indore was the resource person. Dr. Anil Kakuste, Assistant Professor, SVUP Arts and Late Dr. B.S. Desale Science College, Sakri Dist. Dhule (M.S.) coordinated the session and introduced the resource person to the participants. Initially Dr. Shaikh discussed the history and importance of sensors. Then he defined and explained about biosensors. He elaborated the components of biosensors as Bioreceptors, Transducers, Amplifier, Electronics and Interface. After that he discussed characteristics of a biosensors like selectivity, reproducibility, stability and sensitivity, and linearity in detail. He explained Applications of biosensors and types of biosensors. He described thermometric biosensor, optical biosensor, amperometric biosensor, potentiometric biosensors and wearable biosensors. He also explained the development of fluorescence turn on probe for Al(III) sensing, synthesis and molecular structures, their absorption behavior, their emission spectra and fluorescence response time, cell viability and intracellular Al (iii) sensing against cancel cell line. At the end of the session, a vote of thanks was proposed by Dr. Praveen Tyagi, Assistant Professor, St. John's College Agra. The session was very informative and engaging.

**Dr. Shaikh M. Mobin explaining Optical biosensors using nanomaterials**

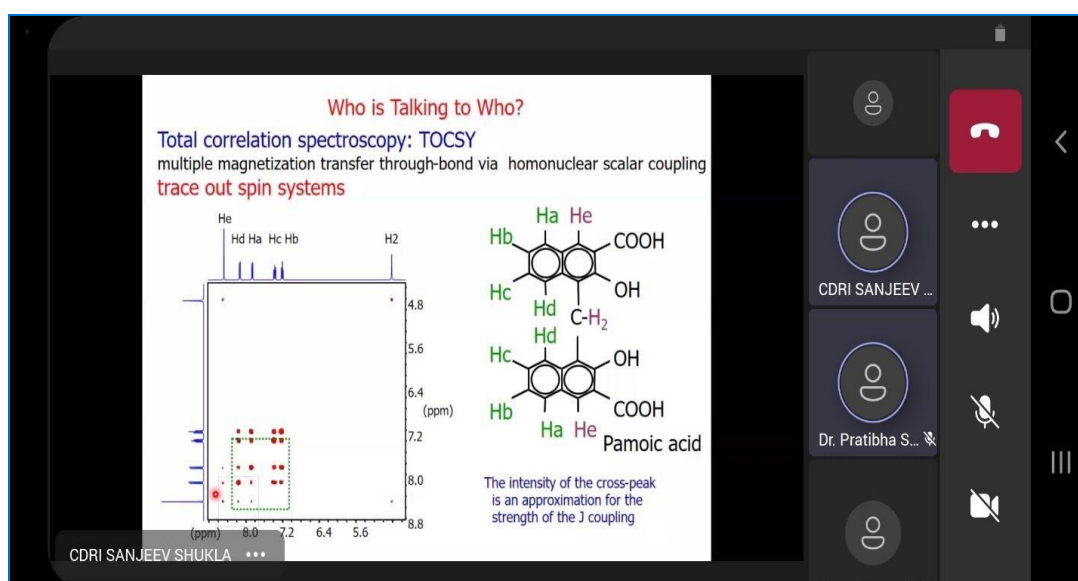
**Date: 20/01/2022; Time: 11:30 AM To 1:00 PM**

**Session: II**

**Resource Person:** Dr. S. K. SHUKLA,  
Principal Scientist, CSIR-CDRI, Lucknow

**Topic: Two-Dimensional NMR and It's Applications.**

In this session, Dr. S. K. Shukla, Principal Scientist, CSIR-CDRI, Lucknow was the resource person. Dr. Lalit P. Gupta, Assistant Professor, B.S.N.V. PG College, Lucknow welcomed and introduced the resource person. Dr. S. K. Shukla began his presentation by outlining the limits of one-dimensional NMR investigations, such as the inability to characterise complicated molecule structures, elucidate 3D structures, study molecular interactions, and conduct conformational and chemical exchange studies. He told that there are two major advantages of multidimensional NMR, that improved resolution and give new information about inter nuclear correlations that unavailable in 1D. After that he elaborated the 2D NMR and types of it. In a single slide, he explained the differences between COSY, TOCSY, NOESY, ROESY, HETCOR, COLOC, HMQC, HMBC, and DOSY. All of these 2D NMR concepts were illustrated using engaging examples. He talked about metabolomic analysis methodologies and using NMR to analyze the metabolic makeup of a tissue in the last part of his session. Dr. Shyamrao Bhagat, Assistant Professor, ICS College of Arts, Commerce and Science, Khed, Dist. Ratnagiri, (M.S.) moved a vote of gratitude at the close of the session. The discussion was both insightful and thought-provoking.

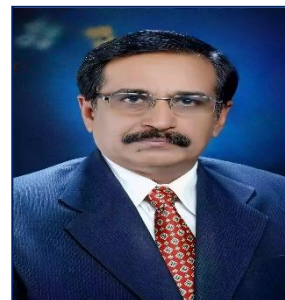


**Dr. S. K. SHUKLA explaining TOCSY**

**Date: 20/01/2022; Time: 2.00 PM To 03:30 PM**

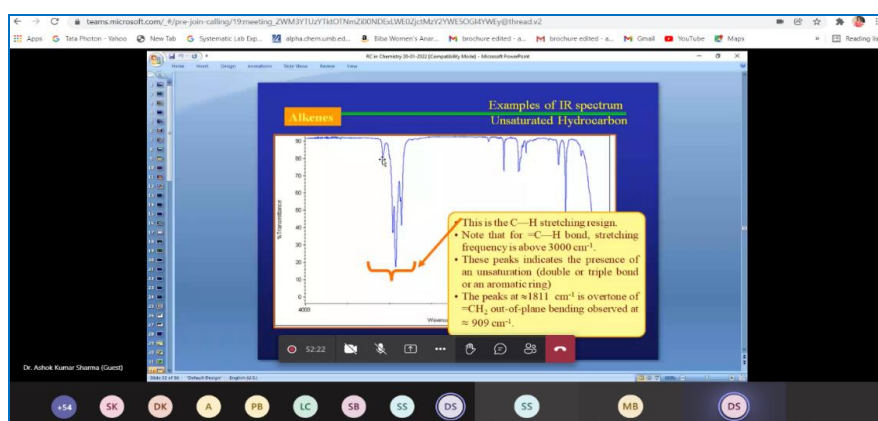
**Sessions: III**

**Resource Person:** Prof. Ashok Kumar Sharma, Rector,  
Professor and Head,  
School of Chemical Sciences,  
Devi Ahilya University, Indore (M.P.)



**Topic: Infrared Spectroscopy: Fundamentals and Structure Elucidation**

The session began with the introduction of the resource person by Dr. Suraj Butoliya, Assistant Professor, Shri Ramdeobaba College of Engineering and Management, Nagpur. The resource person, Prof. Ashok Kumar Sharma, Rector, Devi Ahilya University, Indore, Prof. and Head, School of Chemical Sciences, Devi Ahilya University, Indore (M.P.), spoke on the topic, Infrared Spectroscopy: Fundamentals and Structure Elucidation. He began with the introduction of IR region and its categorisation viz., Near IR, Mid IR and Far IR. He explained in detail about the various types of molecular vibrations - stretching and bending. He also mentioned about the combination and overtone bands. He compared the Raman Spectroscopy with that of IR. He explained the instrumentation of IR spectrometer and also introduced the recent development in this technique i.e., IR spectrometer with ATR facility. He explained the various factors affecting the IR frequency by comparing the absorption frequencies of various functional groups. He also mentioned the effect of ring strain on the absorption frequency of carbonyl group of lactams. He showed several IR spectra of distinct compounds, for example, alkanes, alkenes, aliphatic aldehydes, hydroxy compounds etc. and compared the various bands obtained in each case. He also addressed a number of intriguing IR spectroscopy challenges. Overall, the presentation was both educational and entertaining. Mr. Ram Kumar Saraswat, Astd. Professor, St. John's College Agra, proposed a vote of thanks to the resource person.



**Prof. Ashok Kumar Sharma, explaining IR bands in unsaturated hydrocarbons**

**Date: 20/01/2022; Time: 03:30 PM To 05:00 PM**

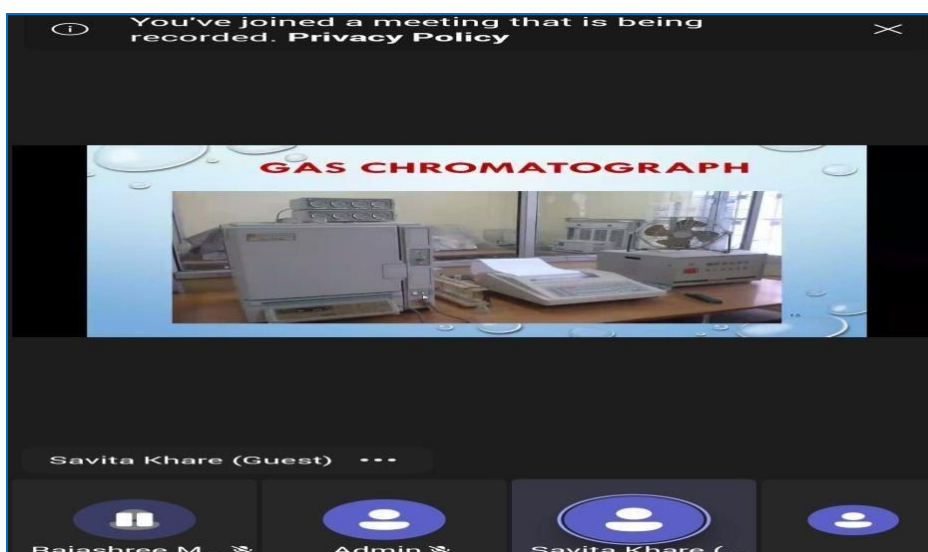
**Session: IV**

**Resource Person:** Dr. Savita Khare, Professor,  
School of Chemical Sciences, DAVV, Indore



**Topic: Gas Chromatography- An Overview.**

For the last session of the day, an eminent resource person was Dr. Savita Khare, Professor, School of Chemical Sciences, DAVV, Indore. The introduction of the speaker was presented by Dr. Archana Ankush Kachare, Assistant Professor, Sunderrao Solanke Mahavidyalaya Majalgaon Dist. Beed. Prof. Khare has started her lecture by introducing and explaining, basics of Chromatography. She has explained the history and discovery of Chromatography technique. She has also explained the detailed classification of chromatographic technique and common working scheme of chromatography. Further she has started to talk about Gas Chromatography and explained the technique, it's types on the basis of mode of separation that is Adsorption and Partition co-efficient. She extended her talk by explaining basic components of Gas Chromatography Instrument by sharing real picture and schematic representation. She has also explained the detailed working mechanism with the help of schematic diagram of GC instrument. Then she has explained every component of GC instrument in detail along with characteristic requirements and examples of each. Prof. Khare also taught the interpretation of chromatogram and applications of technique. The vote of thanks was presented by Mr. Dnyaneshwar Purushottam Gholap, Assistant Professor, Smt. C.H.M. College, Ulhasnagar District, Thane (M.S.).



**Prof. Savita Khare, explaining Gas Chromatograph**

**Day 10; Date: 21/01/2022; Time: 10:00 AM To 11:30 AM**

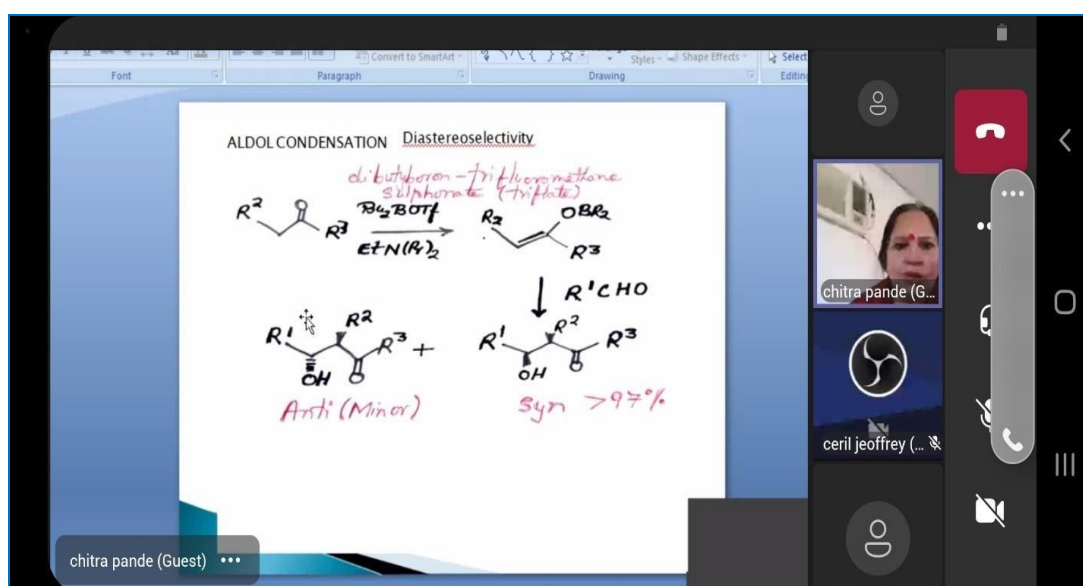
**Session: I**

**Resource Person:** Dr. Chitra Pande, Professor,  
Department of Chemistry, Kumaun University, Nainital



**Topic: Stereochemistry.**

In the first session of day eleven of the course, Dr. Chitra Pande, Professor, Department of Chemistry, Kumaun University, Nainital, was the resource person. Dr. Sandip Choudhary welcomed and introduced the resource person. At the outset Dr. Chitra Pande discussed about the thalidomide, a drug prepared in Germany 1957, due to its undetermined racemic mixture children born had horrific birth defects. She explained the importance of stereochemistry. Then she elaborated the types of isomers, molecules with more than one chiral centres and their properties. She discussed about meso compound, enantiomers, diastereomers, their notations and rules for naming the configuration. After that she discussed the concept of prochirality, asymmetric synthesis, enantiotopic and diastereotopic groups and stereoselectivity. She elaborated the stereochemistry of Aldol condensation, Sharpless asymmetric epoxidation and Negishi reaction. The lecture was very interesting and thought provoking. At the end of the session, a vote of thanks was proposed by Dr. Sandip Choudhary, Assistant Professor, S.P.D.M. Arts, Commerce and Science College Shirpur, Dist. Dhule (M.S.). The session was very insightful and informative.



**Dr. Chitra Pande explaining Distereoselectivity in Aldol condensation**

**Date: 21/01/2022; Time: 11:30 AM To 1:00 PM**

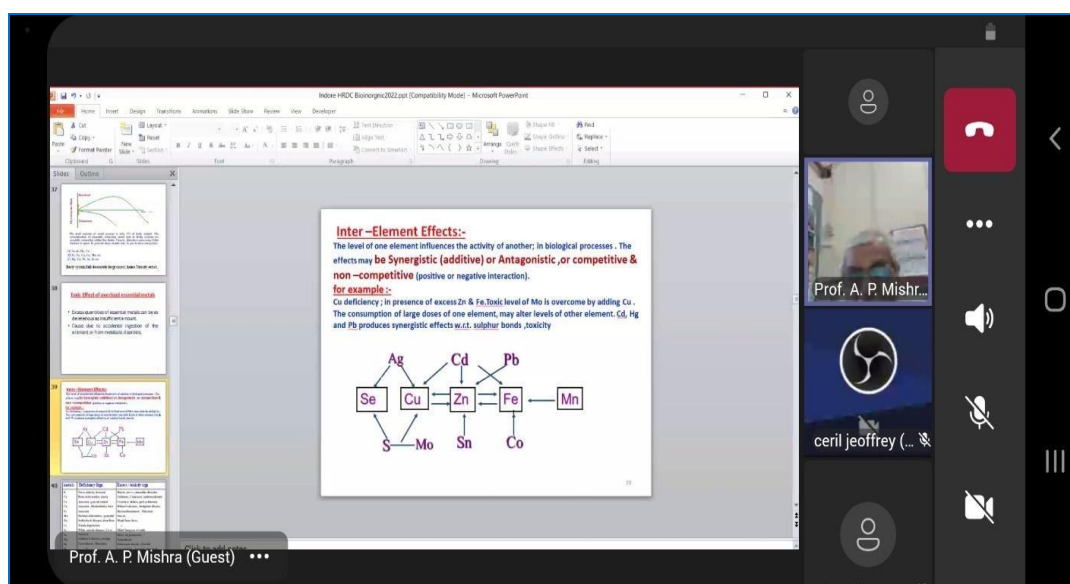
**Session: II**

**Resource Person:** Dr. A. P. Mishra, Professor, Department of Chemistry, Dr. Harisingh Gaur Central University, Sagar (M.P.)



**Topic: Bio-Inorganic Chemistry: some fascinating aspects.**

In this session, Dr. A. P. Mishra, Professor, Department of Chemistry, Dr. Harisingh Gaur Central University, Sagar was the resource person. Dr. Dhiraj Sonawane, Assistant Professor, S.P.D.M. Arts, Commerce and Science College Shirpur, Dist. Dhule (M.S.), welcomed and introduced the resource person to the participants. Dr. A. P. Mishra started his talk with emerging trends in chemistry and chemistry relating to vital and non-vital system. He discussed some recent issues like metal based drugs, bioelectronics and metal interaction with DNA and RNA constituents. He also compared the components of ayurvedic medicines which are also based on metals or bhasma. He pointed out that bio-coordination chemistry has been used in medical science in a variety of ways. He discussed the role of metallic constituents in life and biological processes. He then went on to discuss Metallobiomolecules, their biological roles, the classification of life essential elements, inter element effects, deficiency, toxicity signs, and the physiological roles of metal ions. At the end of the session, a vote of thanks was proposed by Dr. Dhiraj Sonawane. The session was very informative and engaging.



**Dr. A. P. Mishra explaining Inter element effects**

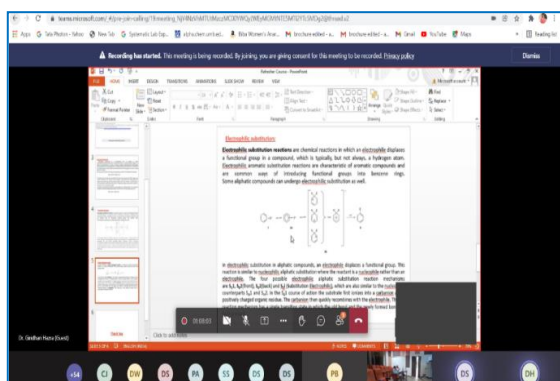
**Date: 21/01/2022; Time: 02:00 PM To 3:30 PM**

**Sessions: III**

**Topic: Seminar Presentation Activity performed by 19 Participants of 24<sup>th</sup> Refresher Course in Chemistry of UGC-HRDC-DAVV-Indore, as a part of Evaluation.**



The session began with the introduction of the two judges. The task of introduction was performed by Dr. Suresh Chandra Yadav, Assistant Professor, Satish Chandra College, Ballia, (U.P.). The respected judges for the session were Dr. Rajesh Sharma, Head, School of Pharmacy, Devi Ahilya University, Indore and Dr. Hemendra Singh Parmar, Senior Assistant Professor (Stage -III), School of Biotechnology, Devi Ahilya University, Indore. Dr. Akhilesh Shende was the first participant to give his presentation. 'Introduction to Infrared Spectroscopy' was his topic. Dr. Dinesh Pund was the next speaker, and his topic was 'Gravimetric Analysis.' Dr. Abdul Wajid Abdul Razique lectured on 'Polarisability (Fajan's Rule).' Dr. Bassa Satyannarayana followed with a presentation on 'Synthesis of High Surface Area Porous Material and Water Oxidation Activity.' Mr. Ramesh Kumar Achat also gave a session about 'Paper Chromatography.' Mr. Prakash Barfa then spoke about 'Nanomaterials.' Mr. Sadik Ahmed Shaikh gave a talk on the 'Valence Shell Electron Pair Repulsion Theory.' The 'Jablonski Diagram' was then presented by Ms. Swati Singh. Mr. Mahesh Baviskar spoke about the "Effect of Conjugation on UV-Visible Spectra." Dr. Sanjay Kumar Singh's talk was titled "2D-Gel Electrophoresis." Dr. Dileep Kumar Singh then presented a talk titled "One Pot, Three Component Approach to Diacylacetonitriles and Diacylmethyl Phosphate." 'Substitution Reactions' was the topic of Dr. Giridhari Hajra's presentation. 'Racemisation and Resolution' was the topic of Dr. Santosh R. Deshmukh's presentation. Dr. Yogesh Patil presented on the topic of 'Lanthanide Contraction.' 'Nucleophilic Acyl Substitution Reactions' was the topic of Dr. Tejendra Rajput's talk. 'One Pot, Three Component Approach to Diacylacetonitriles and Diacylmethyl Phosphate' was the topic of his talk. Dr. Chetna Patil



presented her seminar on 'Development of New Method for the Estimation of Trace Metal Ions by using New Analytical Reagent'. Dr. Parshuram Maske spoke on the topic 'Classification of Polymers'. Dr. Shrikrushna Ubharhande spoke on 'Organometallic Compounds'. Finally, Mr.

Lokesh Jharbade addressed the topic of "Aromatic Electrophilic Substitution".

**Date: 21/01/2022; Time: 03:30 PM To 05:00 PM**

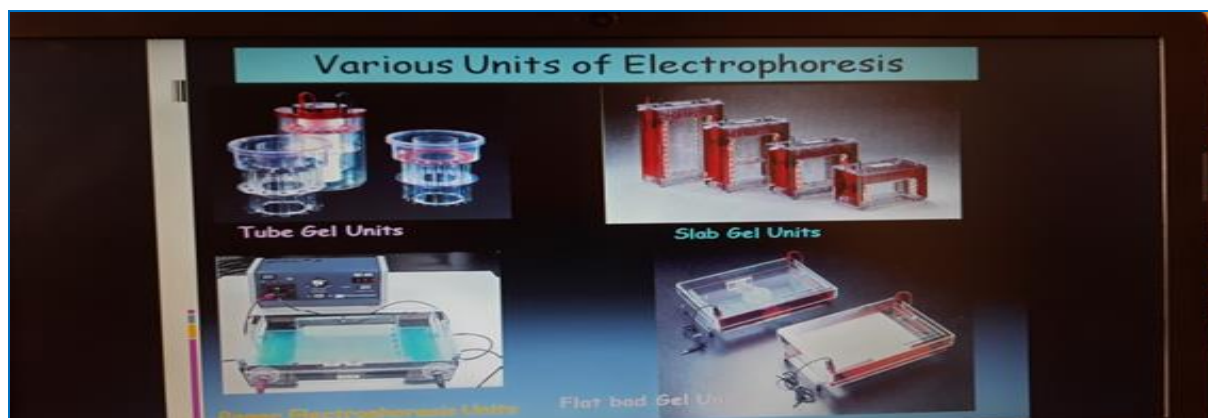
**Session: IV**

**Judges:** Dr. Rajesh Sharma, School of Pharmacy, DAVV, Indore and Dr. H. Parmar, School of Biotechnology, DAVV, Indore

**Topic: Seminar/Presentation session**



As a part of evaluation process of the participants, seminars and presentations were conducted in the fourth session of day 11 of the refresher course. The mode of presentation was Microsoft power point. The presentations given by the participants were evaluated by the renowned judges Dr. Rajesh Sharma, Head, School of Pharmacy, DAVV, Indore and Dr. Hemendra Singh Parmar, School of Biotechnology, DAVV, Indore. Participants have delivered lectures on covering broad range of topics of chemistry domain. Participants have explained their talk with great enthusiasm along with loads of knowledge. A variety of interesting topics like: Valance Cell Electron Pair Repulsion Theory, Electrophoresis, Nucleophilic Substitution Reactions, Spectroscopy, and Chromatography etc. were covered throughout the seminar. Over all the session was wonderful and full of knowledge.



**One of the participant of the 24<sup>th</sup> Refresher Course in Chemistry explaining Electrophoresis**



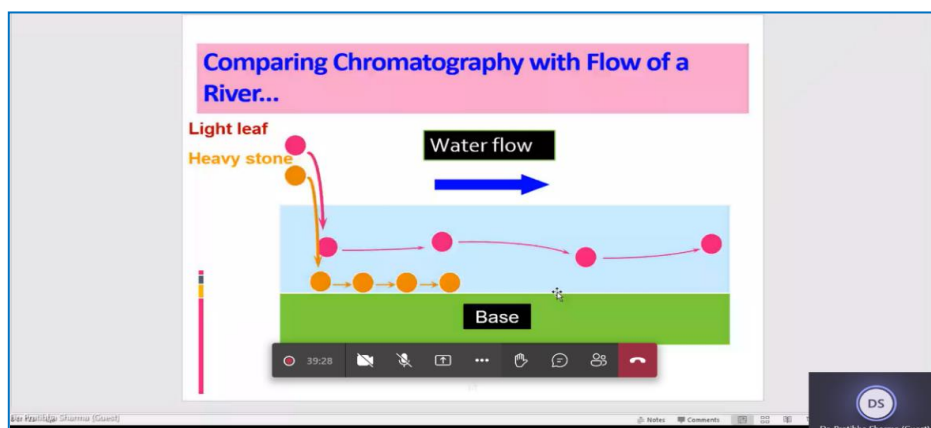
**Session: I**

**Resource Person:** Dr. Pratibha Sharma, Professor & Dean,  
School of Chemical Sciences, DAVV, Indore



**Topic: High Performance Liquid Chromatography.**

In the first session of the day, our distinguished resource person was Dr. Pratibha Sharma, Professor & Dean, School of Chemical Sciences, DAVV, Indore. Mr. Abhay Singh, Sri Baldev PG College Badagaon, Varanasi welcomed and introduced the resource person to the participants. Initially Prof. Sharma discussed the importance of chromatography and spectroscopy. She then compared gas chromatography, high-performance liquid chromatography, and their sensing levels. She went on to say that HPLC is essentially a more advanced version of column liquid chromatography, and that it was originally known as high pressure liquid chromatography. High Performance Liquid Chromatography (HPLC) can be used to separate, identify and quantify the components of a mixture. She elaborated the principle of HPLC and how it is used for quantitative analysis and for trace analysis. She discussed about solvent delivery pumps and about isocratic and gradient elution. She explained types of sample injections, types of columns and about packing materials. She elaborated the various types of detectors of HPLC viz UV-VIS absorbance detector, Fluorescence detector, Refractive index detector etc. and chromatogram parameters like Retention factor, Theoretical plate number, Separation factor, Resolution, Peak asymmetry and various applications of HPLC. At the last part of talk she explained advantages of hyphenated techniques like LCMS. At the end of the session, a vote of thanks was proposed by Mr. Abhay Singh. The session was very informative, worthwhile and full of knowledge.



**Dr. Pratibha Sharma comparing chromatography with flow of river using animations**

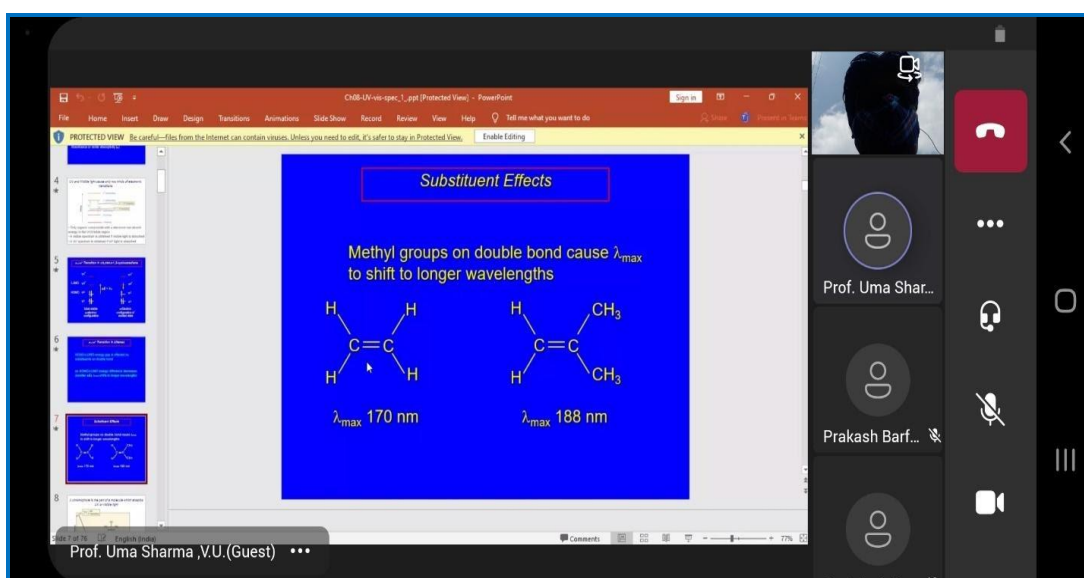
**Date: 22/01/2022; Time: 11:30 AM To 1:00 PM**

**Session: II**

**Resource Person:** Dr. Uma Sharma, Professor, School of Studies in Chemistry and Biochemistry, Vikram University, Ujjain.

**Topic: UV-Vis. Absorption spectroscopy.**

In this session, Dr. Uma Sharma, Professor, School of Studies in Chemistry and Biochemistry, Vikram University, Ujjain was the resource person. Dr. A. Shanavas, Assistant Professor, The new College, Chennai, Tamil Nadu coordinated the session and introduced the resource person. Prof. Sharma started her talk by discussing the regions of the electromagnetic spectrum and its interaction with matter like change of spin, change of orientation, change of configuration and change of electronic distribution. She explained the differences between spectroscope, spectrograph, spectrophotometer and spectrometer. She elaborated the types of electronic transition and the importance of absorbance and absorbed wavelength. After that She explained various applications of UV-Visible spectroscopy. At the last part of the talk she discussed substituent effect, conjugation effect, solvent effect and various examples of it. At the end of the session, a vote of thanks was proposed by Dr. A. Shanavas. The session was very informative.



**Dr. Uma Sharma explaining Substituent effect.**

**Date: 22/01/2022; Time: 02:00 PM To 03:30 PM**

**Sessions: III**

**Judges:** Dr. Rajesh Sharma, School of Pharmacy, DAVV, Indore and  
Dr. H. Parmar, School of Biotechnology, DAVV, Indore

**Topic: Seminar Presentation Activity performed by 17 Participants of 24<sup>th</sup> Refresher Course in Chemistry of UGC-HRDC-DAVV-Indore, as a part of Evaluation.**

The session began with the seminar presentation by Dr. S. Shahida Parveen, who delivered a talk on 'Pumbagin in Colorimetric and Ratiometric Sensor for Arginine'. Further, Ms. Asmita Sandesh Naik Gaonkar, presented on 'Chemistry of Cosmetics'. Next, Bishwajit Gopal Roy presented on 'Strategies for Synthesis of Bioactive Organic Molecules'. Then, Ceril Jeoffrey presented on 'Alphabets in the Nomenclature of Di-Substituted Benzene'. Next, Dr. Lalit Prakash Gupta spoke on 'Ionic Liquid-in Organic Synthesis'. Dr. Archana Ankush Kachare gave a talk on 'Metal Complexes of some Biologically Active Ligands: Synthesis, Characterisation and Antimicrobial Studies'. Further, Dr. Suraj Butoliya spoke on Water Technology-Ion Exchange Process. Next, Dr. Sandip Chaudhari presented on the topic 'H-NMR Spectroscopy'. Then, Mr. Abhay Singh presented on 'Optical Isomerism'. Next, Dr. Suresh Chandra Yadav talked on 'Group Theory'. Next, Dr. Abhishek Upadhyay spoke on 'Aldol Reaction'. Mr. Dhiraj Sonawane presented on 'Electrophilic Aromatic Substitution'. Further, Dr. A. Shanavas presented on 'A Brief Introduction to Liquid Crystals'. Mr. Dnyaneshwar Purushottam Gholap presented on the topic 'Application of Computer Software in Teaching of Chemistry'. Mr. Ram Kumar Saraswat presented on the topic 'Hyperconjugation'. Then, Dr. Shyamrao Bhagat spoke on 'New Catalyst in Alcohol Fermentation'. Lastly, Dr. Praveen Tyagi gave a talk on 'Water Quality Parameters'.

**Ionic liquids**

NaCl (mp 801°C)      BMIm PF<sub>6</sub> (mp -79°C)

- Ionic liquids are salts, with melting points below ambient temperature
- They are composed solely of anions and cations – no water is present
- Their regular, ordered structure gives them very different properties to conventional

Dr. Lalit Prakash Gupta (Gupta)

BS MB AS PB DS DT BR AK DG CA DS

**Dr. Lalit Prakash Gupta, participant of the 24<sup>th</sup> Refresher Course in Chemistry explaining about ionic liquids.**

**Date: 22/01/2022; Time: 03:30 AM To 05:00 PM**

**Session: IV**

**Judges:** Dr. Rajesh Sharma, School of Pharmacy, DAVV, Indore and  
Dr. H. Parmar, School of Biotechnology, DAVV, Indore

**Topic: Seminar/Presentation session**

The fourth session of day 12 of the refresher course was full of energy and tremendous knowledge. As a part of evaluation process of the participants, seminars and presentations are conducted in the fourth session of day 12 of the refresher course. Many participants have presented short talk of 4-5 minutes, on various topics. A variety of attention-grabbing topics like: Types of spectroscopy, Polymers, Electrophoresis, Substitution Reactions, NMR Spectroscopy, Li battery, and Chromatography, Water purification and its specifications etc were covered during the seminar presentations. The presentations were conducted online via Microsoft team platform and mode of presentation was Microsoft power point. The presentations given by the participants were evaluated by the renowned judges Dr. Rajesh Sharma, Head, School of Pharmacy, DAVV, Indore and Dr. Hemendra Singh Parmar, Associate Professor, School of Biotechnology, DAVV, Indore. Participants have delivered lectures on covering broad range of topics of chemistry domain. Participants have explained their talk with great enthusiasm along with loads of knowledge. Over all the session was wonderful and full of knowledge.



**Day 12; Date: 24/01/2022; Time: 10:00 AM To 11:30 AM**

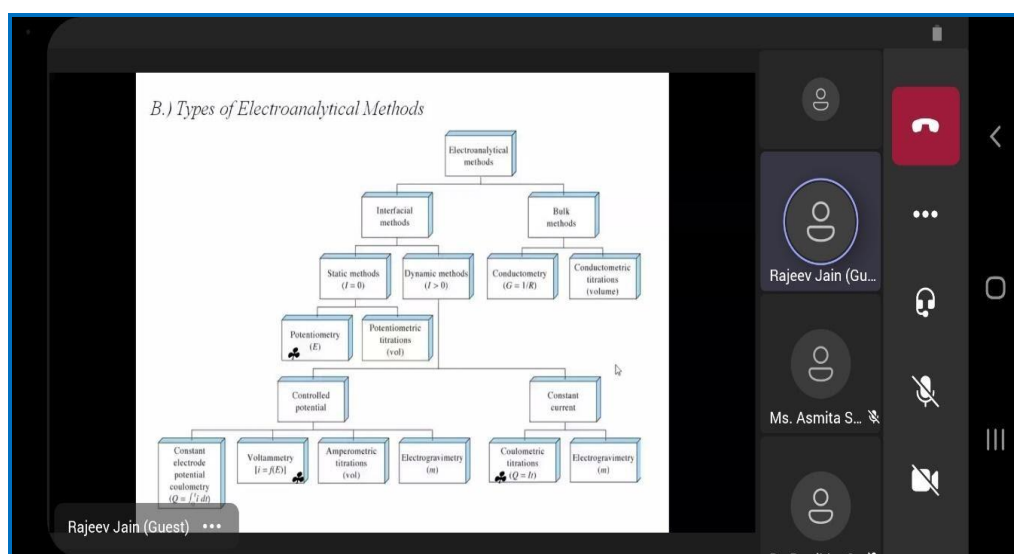
**Session: I**

**Resource Person:** Dr. Rajeev Jain, Pro Vice-Chancellor,  
Pondicherry University, Puducherry



**Topic: Electroanalytical Techniques and their Applications.**

In the first session, Dr. Rajeev Jain, Director, Pondicherry University, Puducherry, was the resource person. Dr. Yogesh Nainwal, Assistant professor Dr. Shivanand Nautiyal Government PG College Karanprayag, Uttarakhand coordinated the session and introduced the resource person. At the outset Prof. Rajeev Jain discussed the history of electrochemistry and Basics of electroanalytical techniques. He said that electroanalytical techniques encompass a group of quantitative analytical methods that are based upon the electrical properties of a solution of the analyte when it is made part of an electrochemical cell. He explained the development of modern polarographic and voltametric methods. Then he elaborated the types of electroanalytical techniques. He then went over faradaic and non-faradaic currents, as well as factors that affect the rate of an electrode reaction. He elaborated the Polarography I/E curve, cyclic & linear sweep voltammetry, pulse & square wave voltammetry, electrochemical treatment system, scan rate effect. He explained case studies in pharmaceutical and environmental investigations at the end of his presentation. Dr. Yogesh Nainwal proposed a vote of thanks at the end of the session. The session was both worthwhile and informative.



**Dr. Rajeev Jain explaining the types of electroanalytical techniques.**

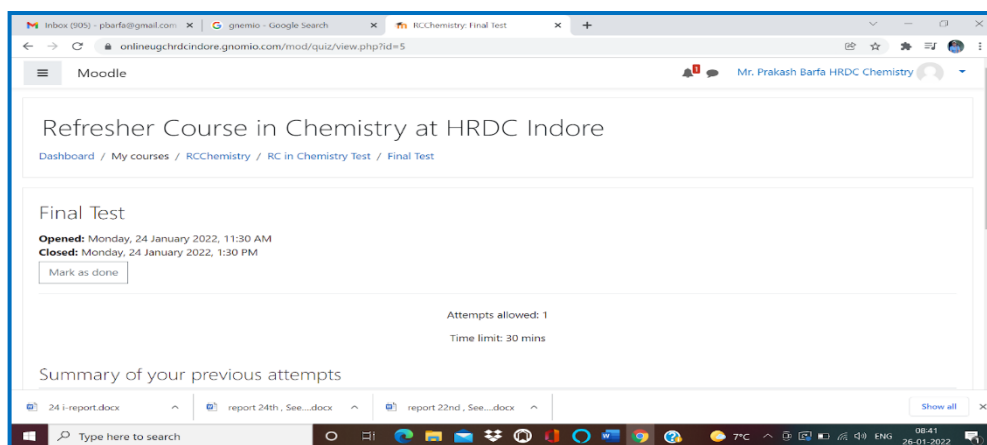
**Date: 24/01/2022**

**Time: 11:30 AM To 1:00 PM**

**Session: II**

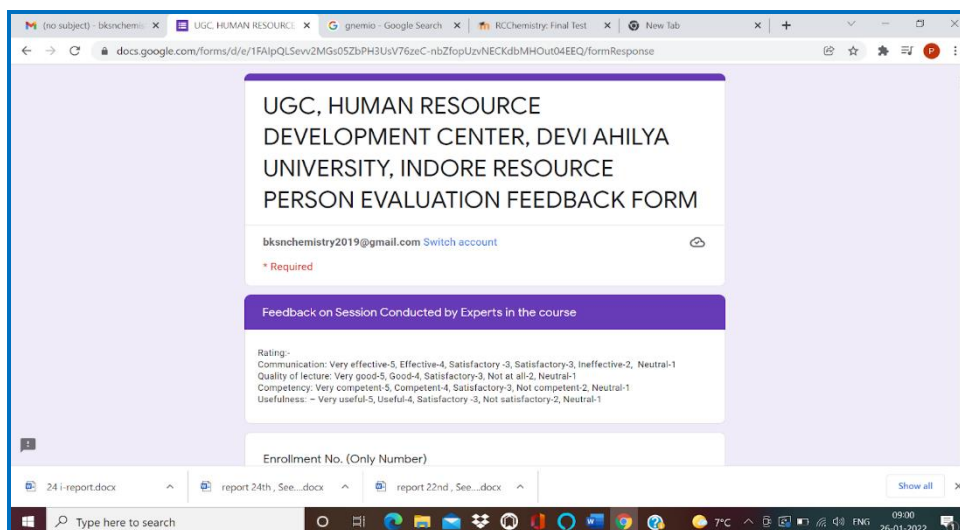
**Test for Evaluation and Feedback session on measured parameters.**

In this session, an online test of the participants was conducted on the Moodle Gnomio platform, as part of the evaluation. The test consisted of 25 questions, each worth one mark, that had to be completed in 30 minutes. The questions came from the numerous domains that were taught in this course.



### **Final online test on Moodle Platform**

Furthermore, feedback is an essential component of any course that aids in SWOC analysis. Following the completion of the test, a google form link was supplied for feedback on expert-led sessions. Feedback was given by participants on various criteria viz Communication, Quality of lecture, Competency and usefulness of lecture for all the distinguished resource persons.



### **Resource person Evaluation Feedback Form**

**Date: 24/01/2022**

**Time: 1.45 PM to 3.15 PM**

**Sessions: III**

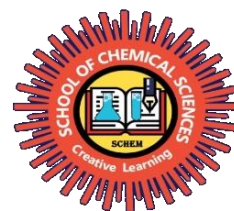
**Valedictory function for the 24<sup>th</sup> Refresher Course in Chemistry of UGC-HRDC, Devi Ahilya University (DAVV), Indore**

The valedictory session of the refresher course organised by UGC-HRDC-DAVV, Indore was marked by the gracious presence of Chief Guest Dr. Anamik Shah, Ex Vice Chancellor of Gujarat Vidyapith and President of Indian Society of Chemists and Biologists, the Hon'ble Vice Chancellor Devi Ahilya University, Indore Dr. Renu Jain madam, Dr. Ashok Kumar, Rector of Devi Ahilya University, Indore and Head of School of Chemical Sciences, DAVV, Indore, Director of UGC-HRDC, DAVV, Indore Dr. Namrata Sharma, Coordinators of Refresher Course Dr. Pratibha Sharma, Dean Faculty of Sciences, DAVV, Dr. Savita Khare, Professor, School of Chemical Sciences, DAVV and all the participants of the 24<sup>th</sup> Refresher Course in Chemistry. The function was conducted by one of the participants of the refresher Course, Mr. Prakash Barfa, Assistant Professor, B.K.S.N. Government College, Shajapur, (M.P.). The session began with the kulgeet of Devi Ahilya University, Indore. The welcome address was delivered by Dr. Namrata Sharma, Director of UGC-HRDC, DAVV, Indore. Dr. Pratibha Sharma, the course coordinator, also delivered a report on the proceedings of the whole refresher course from January 11 to 24, 2022. Mr. Prakash Barfa then presented a slide show that included images of all of the prominent invited resource persons of the course. Also, there were photographs of the entire organising team of refresher course and the chief guest of the valedictory function. The presentation also showcased the photograph and details of the participants of the refresher course. The Hon'ble Vice Chancellor, Dr. Renu Jain, then spoke to the virtual audience. She spoke on importance of 'Vidhya' and also praised the smooth conduct of the course. Dr. Naveen Avasthi, Ms. Asmita Naik Gaonkar, Dr. Biswajit Roy, Dr. Santosh R. Deshmukh, Dr. Abdul Wajid and Dr. M. Ganapathi provided brief and insightful feedback about the course. Dr. Rajashree Markandewar, Assistant Professor, Rashtrapita Mahatma Gandhi Arts, Commerce and Science College, Saoli, District Chandrapur, Maharashtra, introduced the Chief Guest of the function, Dr. Anamik Shah. Further, the Chief Guest addressed the virtual gathering and delivered his motivational talk. The vote of thanks for the valedictory session was proposed by the course coordinator, Dr. Savita Khare. The session came to a close with the playing of the national anthem.



# 24<sup>th</sup> Refresher Course in Chemistry

January 11 – 24, 2022



Organized by  
**Human Resource Development Centre**  
Devi Ahilya University, Indore (M.P.)

In Association with  
**School of Chemical Sciences**

**Valedictory Session**



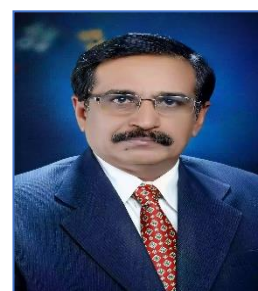
**Dr. Namrata Sharma**  
Director  
Human Resource Development  
Centre, Devi Ahilya University,  
Indore



**Prof. Anamik Shah**  
Chief Guest  
President of Indian Society  
of Chemist and Biologist



**Prof. Renu Jain**  
Vice-Chancellor  
Devi Ahilya University,  
Indore



**Prof. Ashok Kumar**  
Rector  
Devi Ahilya University,  
Indore



**Prof. Pratibha Sharma**  
Course Coordinator



**Prof. Savita Khare**  
Course Coordinator