SNJB (Jain Gurukul's)
K.K.H. Abad Arts, S.M.G. Lodha Commerce & S.P.H. Jain Science College
Neminagar, Chandwad-423101,Dist.-Nashik, Maharashtra

Establishment
27/11/1928

(Affiliated to SavitribaiPhule Pune University) Id. No.PU/NS/AC/015/1970

(02556) Off. 252125 Res.252126 Tel. Fax:02556-252125
• P. O. Box No.: 6 • E-mail : alccchandwad@yahoo.co.in
• Website : www.acschandwadcollege.com

DST-FIST Funded (2018-19) **UGC-NSQF Courses (B.Voc. & CC)**
Best College Award by SavitribaiPhule Pune University (2015-16)

1.3.2: Number of courses that include experiential learning through project work/field work/internship during the year

M.Sc. I. Analytical Chemistry – Project/OJT

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Savitribai Phule Pune University

(Formerly University of Pune)

Post-Graduate Program in Chemistry

(Faculty of Science and Technology)

New Syllabi (As Per National Education Policy-2020) for

M.Sc. (Chemistry) Part-I

(Physical Chemistry, Inorganic Chemistry and Analytical Chemistry)

(For Colleges Affiliated to Savitribai Phule Pune University)

To be implemented with effect from Academic Year 2023-2024

1. Preamble:

The global education development agenda reflected in the Goal 4 (SDG4) of the 2030 Agenda for Sustainable Development, adopted by India in 2015 - seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". Such a towering goal will require the entire education system to be redesign to support and foster learning, so that all of the critical targets for Sustainable Development can be achieved. National Education Policy 2020 is the first education policy of the 21st century and aims to address the many growing developmental imperatives of our country. This Policy proposes the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirational goals of 21st century education, including SDG4. The NEP 2020 is based on the principle that education must develop critical thinking and problem solving abilities along with social, ethical, and emotional capacities.

The M.Sc. Chemistry syllabi is revised as per the guidelines of UGC, Government of Maharashtra and Savitribai Phule Pune University, Pune. With NEP-2020 in background, the revised curricula will articulate the spirit of the policy by emphasizing upon- integrated approach to learning; innovative pedagogies and assessment strategies; multidisciplinary and Interdisciplinary education; creative and critical thinking; student-centric participatory learning; imaginative abilities and flexible curricular structures to enable creative combination of disciplines for the study. The M.Sc. Chemistry Programme will transmit advanced knowledge of chemical sciences along with its fundamentals. In this programme, students will be empowered with assignments in academia and industry to provide the skills and information necessary for creating employment. The Programme exposes students to significant advances in chemical sciences as well as related fields through multidisciplinary and interdisciplinary courses. The design of the syllabi is such a way that it addresses chemical safety, green chemistry principles and industrial skills. It is intended to bring out the best in each student's ability, to sharpen their scientific temper, and to keep them up to date on recent developments in the field.

The Aims of the programme are:

a) To impart basic and advanced knowledge of chemical sciences among students.
b) To provide adequate blend of theory, computation and hands-on experiments.
c) To provide higher education, disciplinary and inter/multi-disciplinary research oriented knowledge to the students.

d) To provide a learned, skilled and creative pool of graduates who are ready to take up challenging assignments in different kinds of chemical industries, research institutions and academia.

e) To foster responsible, proactive individuals who are equipped with rational thinking and competencies to address local challenges.

The M.Sc. Chemistry course structure consists of a well-balanced mix of Major Core, Major Electives, Research oriented courses, On-Job training/Internship and Project based learning. Out of total of 88 credits, 18 credits have been allotted to Research methodology and Project based learning. For M.Sc. Chemistry Degree, a student has to earn the minimum 88 credits from their four semesters. If students complete 44 credits in PG first year, he/she can exit with PG Diploma or continue with PG second year. The M.Sc. Chemistry course structure is based on following credit framework as per the guidelines of the university and government of Maharashtra.

Credit Framework for M.Sc. Chemistry Programme

Level	**Semester**	**Credits Related to Major**		**Research Methodology (RM)**	**Internship Job Training (OJT)**	**Research Project (RP)**	**Total**
6.0	I	10 (T) + 4 (P)	2 (T) + 2 (T/P)	4	0	0	**22**
	II	10 (T) + 4 (P)	2 (T) + 2 (T/P)	0	4	0	**22**
Exit Option: Award of PG Diploma on Completion of 44 credits at 6.0 level (PG First Year) or Continue with PG Second Year							
6.5	III	10 (T) + 4 (P)	2 (T) + 2 (T/P)	0	0	4	**22**
	IV	8 (T) + 4 (P)	2 (T) + 2 (T/P)	0	0	6	**22**
Total 4 Years		**54**	**16**	**4**	**4**	**10**	**88**
Abbreviation: T – Theory, P - Practical							

Guidelines for conduction of classes:

a) A student has to attend 1-hour classroom teaching per week for one credit of theory and 2 hours' lab work/problem-solving session/ related activities per week for one credit of practical. Practical sessions (lab work/problem-solving session/related activity) will be conducted in batches. A batch for such sessions will be of size maximum of 08 students.

b) 4 Credit courses will have 60 lectures (48 L + 12 T) and 2 Credit courses will have 30 lectures (24 L + 6 T)

c) The Department may conduct necessary lectures/workshops as a part of OJT.

d) Each course of 4 credits will carry 100 marks and 2 credit courses will carry 50 marks.

e) There will be Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) for each course.

Evaluation process:

a) The CIE will be based on minimum two internal tests (IT). In addition, a teacher may consider one or more of the following. (i) Home Assignments (ii) Seminar/Presentation (iii) Laboratory assignment (iv) Group Discussions (v) Oral (vi) Research Paper/Book Review (vi) Technology Demonstration (vi) Case study (vii) Survey report, etc.

b) Students has to score a minimum of 40 % separately in CIE and SEE, otherwise the result of such a course will be FAIL.

Eligibility:

B.Sc. Chemistry/B.Sc. (Blended) Chemistry/ B.E./B.Tech. with Chemistry subject (at least in second year) as per the rules and regulations given by Savitribai Phule Pune University, Pune.

2. Programme Outcomes (POs)

PO No.	PO Statement After completing the Master of Science degree students are able to	Knowledge and Skill
PO-1	Learn the terms, theories, assumptions, methods, principles, theorem statements and classification	Disciplinary knowledge
PO-2	Fix out the problem and resolve it using theories and practical knowledge.	Critical thinking and Problem solving
PO-3	Inculcate his knowledge for carrying projects and advanced research related skills.	Research related skill
PO-4	Actively participate in team on case studies and field-based situations.	Cooperation/Team work
PO-5	Analyze and interpret ideas, evidences and experiences with learned scientific reasoning	Scientific reasoning
PO-6	Aware and implement the subject facts that can be applied for the personal and social development	Reflective thinking
PO-7	Use digital literacy to retrieve and evaluate subject related information	Information/Digitally literacy
PO-8	Get moral and ethical values for society as well as in research	Moral and ethical awareness
PO-9	Give analytical reasoning to interpret research data.	Analytical Reasoning
PO-10	Improve their managerial skills and abilities in subject related activities.	Leadership readiness/qualities
PO-11	Inculcate continuous learning habit through all available resources.	Lifelong readiness/qualities

3. Programme Specific Outcomes (PSOs)

PO-No.	Outcomes	Component
PSO-1	Demonstrate a comprehensive knowledge of all disciplines.	Disciplinary knowledge
PSO-2	To assess and evaluate facts, claims and arguments using their scientific knowledge	Critical thinking
PSO-3	To define a problem, analyse, interpret and draw conclusion by planning, implementing and reporting the results of an experiment.	Research-related skills
PSO-4	To access, evaluate and apply a variety of useful sources	Information/digital literacy
PSO-5	To participate in multicultural society and communicate the subject knowledge for the betterment of society	Multicultural competence
PSO-6	To acquire knowledge and skills including "Learning how to learn" that are necessary in learning activities throughout life	Lifelong learning

4. Course Structure

M. Sc. Chemistry Part-I

(Physical Chemistry, Inorganic Chemistry and Analytical Chemistry)

Semester I

Sr. No.	Course Title	Course Code	Major Core/ Major elective	Credits
1	Physical Chemistry-I	CHE-501	Major Core	4
2	Inorganic Chemistry-I	CHE-502	Major Core	4
3	Organic Chemistry-I	CHEPIA-503	Major Core	2
4	Physical Chemistry Practical -I	CHE-504	Major Core	2
5	Inorganic Chemistry Practical-I	CHE-505	Major Core	2
6	Organic Chemistry Practical-I	CHE-506	Major elective	2
7	Chemical Mathematics	CHE-507(A)	Major elective	2
	Chemistry of Nanomaterials	CHE-507(B)		
	Analytical Chemistry	CHE-507(C)		
	Basic Organic Chemistry	CHEPIA-507(D)		
8	Research Methodology	CHE-508	RM	4

Semester II

Sr. No.	Course Title	Course Code	Major Core/ Major elective	Credits
1	Physical Chemistry-II	CHE-551	Major Core	4
2	Inorganic Chemistry-II	CHE-552	Major Core	4
3	Organic Chemistry-II	CHEPIA-553	Major Core	2
4	Physical Chemistry Practical -II	CHE-554	Major Core	2
5	Inorganic Chemistry Practical-II	CHE-555	Major Core	2
6	Organic Chemistry Practical-II	CHE-556	Major elective	2
7	Organometallic Compounds and Inorganic Reaction Mechanism	CHE-557(A)	Major elective	2
	Material Characterization Techniques	CHE-557(B)		
	Green Chemistry	CHE-557(C)		
	Pericyclic Reactions and Photochemistry	CHEPIA-557(D)		
8	On-Job Training/Internship	CHE-558	OJT/Internship	4

Department of Chemistry

SNJB's KKHA Arts, SMGL Commerce and SPHJ Science College, Chandwad
Dist- Nashik, Maharashtra- PIN-423 101
(DST-FIST Funded December-2018)
(02556) Off. 252125 Res.252126 Tel. Fax: 02556-252125
Est. 27/11/1928 P. O. Box No.: 6 • E-mail: alccchandwad@yahoo.co.in
Website: www.acschandwadcollege.com
Dr. R. S. Sancheti (Head, Dept. of Chemistry)
E-mail: sanchet83@gmail.com

M.Sc. I Analytical Chemistry On Job Traning Student List 2023-24

Sr. No.	Name Of Student
1	ABU TALHA KHALID A
2	AHER MANOHAR G
3	AHER SHITAL G
4	ANSARI SIKANDAR A.
5	DESHMUKH AKANKSHA D
6	DESHPANDE ANUSHKA A
7	FARTALE ROHINI B
8	HABADE KALYANI D
9	KHAIRNAR KAVITA H
10	LOHAKARE SUMIT V
11	MAHALE ROHINI S.
12	MHASKAR SURAJ D
13	PAGAR PRIYANKA R
14	PAWAR DHANSHRI S
15	PAWAR KANCHAN K
16	PAWAR KAUSHALYA B
17	PAWAR PRATIKSHA S
18	SHAIKH IMRAN S
19	SONAVANI SUNIL P
20	SONAWANE RUSHIKESH S
21	TARIQUE AHMAD ABDUL
22	WADGHULE AARTI R

HEAD
Department of Chemistry
SNJB's K.K.H.A.Arts, S.M.G.L.Commerce
& S.P.H.J.Science College,
Chandwad-423 101 Dist- Nashik

: 9307686710

Date:- 05/12/2022

To,

The PRINCIPAL

SNJB'S KKHA Arts, SMGL Commerce & SPHJ Science College,

Chandwad, Nashik

SUBJECT :- Collaboration between ARNI Analytical and SNJB'S KKHA Arts, SMGL Commerce & SPHJ Science College Chandwad. Nashik

Respected Sir,

We are collaborating with SNJB's KKHA Arts, SMGL Commerce & SPHJ Science College Chandwad, Nashik.

The Intent of this collaboration is to provide training to M. Sc. Chemistry students. It was decided to provide training on the Instruments which are required in pharmaceutical industries. We agree to facilitate college training workshops, lecture and internship etc. I hope that college will also provide their infrastructure for smooth working. This collaboration is from December-2022 to December-2026

DIRECTOR

Mr. Masum G. Deshmukh

ARNI Analytical, Nashik

ARNI ANALYTICAL ★ NASHIK ★

ON JOB TRAINING

(Pharmaceutical Industrial Analysis)

Report Of A Project Carried Out As A Part Of Curriculum For The

MSC –I [CHEMISTRY] CHE-558 TRAINING /INTERNSHIP

[4 CREDIT ,120 HOURS]

Submitted By

Shaikh Imran Shakil

[M.Sc.-I –(ORGANIC / ANALYTICAL CHEMISTRY]

Supervised By

Mr .Masum G.Deshmukh

ARNI ANALYTICAL

Dr.R.S.Sancheti

[Faculty Coordinator]

Associate Professor

Submitted To

Savitribai Phule Pune University, Pune [2023-2024] Department Of Chemistry ,

SNJB's ACS College Chandwad. Nashik Affiliated To

DECLARATION BY THE CANDIDATE

I hereby declared that this project entitled **"ON JOB TRAINING (Pharmaceutical Industrial Training)"** is bonfied and genuine project work carried out by us under supervision of **Mr. Masum G. Deshmukh** from ARNI ANALYTICAL

Date:- 08/05/2024

Place:- chandwad

Shaikh Imran Shakil

NAME AND SIGNATURE OF THE STUDENT

ARNI
ANALYTICAL
Add: Pushpak App. Flat No.102,Lane No. 3,
Near Neurocare Hospital, Pandit Colony, Nashik
e-mail : arnianalyticals@gmail.com

ISO 9001

Shri Neminath Jain Brahmacharyashram (JainGurukul's)
Karmveer Keshavlaji Harakchandji Abad Arts,
Shriman Motilaji Giridharilalji Lodha Commerce
and Shriman P.H. Jain Science College,
Neminagar, Chandwad, Dist .Nashik -423101
SNJB

Certificate

This is to certify that Imran Shakil Shaikh
Student of "Department of Chemistry, SNJB's ACS College , Chandwad, Nashik" Studied in M.Sc.- I yr. (Analytical chemistry) has Successfully completed on job Training Course in Pharmaceutical Industrial Analysis of 120 hrs.
The training period is from .21-03-2024 to 20-04-2024

H.O.D.

Principal

Director

CERTIFICATE BY THE FACULTY COORDINATOR

This is to certify that entitled **"ON JOB TRAINING (Pharmaceutical Industrial Training).** The training work done by ***Shaikh Imran Shakil*** fulfilment of the requirement for MSc –I [ANALYTICAL CHEMISTRY] CHE 558 On Job Training/ Internship [4 Credits,120 hours]

Date 8-5-2024

Place- chandwad

Dr.R.S.Sancheti

Associate Professor

Department of Chemistry

SNJB's ACS College Chandwad.

CERTIFICATE BY THE EXTERNAL EXAMINER

This is to certify that entitled "**ON JOB TRAINING (Pharmaceutical Industrial training)**" is a bonafide and genuine project work done by ***Shaikh Imran Shakil*** fulfilment of the requirement of MSc – I [Analytical Chemistry] CHE-558, On job training/ Internship [4 credits, 120 hours].

Date:- 8-5-2024

Place:- chandwad

8/5/2024

[External Examiner]

Name & Signature

8/5/24

[Internal Examiner]

Name & Signature

CERTIFICATE

This is to certify that projected entitled "**ON JOB TRAINING (Pharmaceutical Industrial Training)**" The Training work done by ***Shaikh Imran Shakil*** under supervision of Mr Masum G. Deshmukh

Dr. R.S.Sancheti sir
Head of Department

HEAD
Department of Chemistry
SNJB's K.K.H.A.Arts, S.M.G.L.Commerce
& Smt.N.B.Mehta College,
Chandwad-423 101 Dist- Nashik

[Faculty Coordinator]

Principal

SNJB's ACS College Chandwad.

ACKNOWLEDGEMENT

We would like to take the privilege to thank the selfless people from the core of our heart who with their constant support, affection, inspiration and encouragement made us feel comfortable to successfully complete this venture.

Our deep sense of gratitude and thanks to my supervisor **Mr Masum G. Deshmukh** for his expert guidance, constant encouragement, stimulating discussion .

I am thankful **to, *Dr.R.S.Sancheti.Sir*** for support and providing all the necessary facilities during the course of On Job Ttraining and guided me in light path of the life.

It is our privilege to express our gratitude and sinc eeere thanks for their unconditional moral support

Our acknowledgement is many more what we have expressed here.

Date- 8-5-2024

Place- chandwad

Shaikh Imran Shakil

Name and Signature of the student

INDEX

Introduction

An introduction to the industry typically covers its key components, major players, trends, challenges, and opportunities. It provides an overview of the sector's structure, operations, and significance in the economy, often including historical context and future projections.

Definition and Scope: Define the industry and outline its scope. This could be broad (e.g., automotive industry) or narrow (e.g., electric vehicle manufacturing).History: Provide a brief history of the industry, including key milestones, technological advancements, and major players.

Market Size and Importance: Highlight the industry's economic significance, including its contribution to GDP, employment, and global trade.

Key Players: Identify the major companies and organizations within the industry, including both incumbents and emerging players.

Value Chain: Describe the value chain of the industry, from raw materials and production to distribution and consumption.

Market Trends: Discuss current trends shaping the industry, such as technological innovations, regulatory changes, and shifting consumer preferences.

Challenges and Opportunities: Analyze the challenges facing the industry, such as competition, supply chain disruptions, and sustainability concerns, as well as the opportunities for growth and innovation.

Future Outlook: Offer insights into the future prospects of the industry, including growth projections, emerging markets, and potential disruptors.

An industry is a group of many organizations involved in the production as well as in the manufacturing or handling of the same type of product and service. All the industries are part of the secondary activity. The secondary or the manufacturing converts all the raw materials into products of more value to the people.

Department in Pharmaceutical Companies

The pharmaceutical industry encompasses various departments such as research and development, manufacturing, quality control, marketing, sales, and regulatory affairs. Each department plays a crucial role in the development, production, and distribution of pharmaceutical products.

Some pharmaceutical companies based in Nashik include:

- Glenmark Pharmaceuticals Ltd.
- Emcure Pharmaceuticals Ltd.
- Mahindra Sanyo Special Steel Pvt. Ltd. (Manufactures pharmaceutical stainless steel)
- Divine Laboratories Pvt. Ltd.
- Panacea Biotec Ltd. (Has a manufacturing facility in Nashik)

The mission of The Department of Pharmaceutical Care & Health Systems is to advance the practice of pharmaceutical care and its role in the health care system for the benefit of patients and society through professional, graduate, and post-graduate education, research and service.

These companies often lead in terms of revenue, research and development efforts, and the production of blockbuster drugs that address critical health issues worldwide.

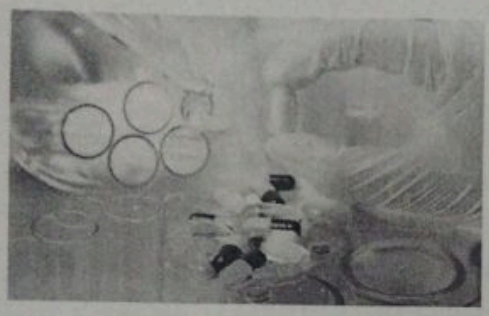
pharmaceutical company names:

- Pfizer
- Johnson & Johnson
- Roche
- Novartis
- Merck & Co.
- GlaxoSmithKline (GSK)
- Sanofi
- AstraZeneca
- AbbVieEli Lilly and Company

Pharmaceutical companies are organizations that research, develop, manufacture, and market drugs or pharmaceutical products. They play a vital role in the healthcare industry by providing medications to treat diseases and improve health outcomes.

Medicines

"Medicine" is a broad term referring to substances or treatments used to diagnose, treat, or prevent diseases, illnesses, or injuries in humans and animals. It includes pharmaceutical drugs, over-the-counter medications, vaccines, medical devices, and other therapies. Medicine plays a crucial role in maintaining and improving health outcomes and quality of life.



Here are some common types of medicines:

- Prescription Drugs: These are medications that can only be obtained with a prescription from a licensed healthcare provider.
- Over-the-Counter (OTC) Drugs: These are medications that can be purchased directly from pharmacies, drugstores, or supermarkets without a prescription.
- Generic Drugs: These are pharmaceutical equivalents to brand-name drugs, typically produced after the brand-name drug's patent expires.
- Biologics: These are medicines derived from living organisms or their components, such as proteins, antibodies, or nucleic acids. Biologics are often used to treat complex diseases like cancer, autoimmune disorders, and genetic conditions.
- Vaccines: These are biological preparations that stimulate the immune system to produce immunity to a specific disease, typically by introducing a weakened or killed form of the pathogen.
- Topical Medications: These are Instrument used in pharmaceutical industry
- Analytical Balance
- Accuracy and Precision: Analytical balances are designed to provide highly accurate and precise measurements, often with readability to several decimal places (e.g., milligrams or micrograms). They are capable of measuring small masses with sensitivity and reliability.
-

- Calibration: Analytical balances require regular calibration using calibrated weights to ensure accurate and traceable measurements. Calibration adjusts the balance's performance to compensate for any deviations from the standard reference values.
- Environmental Conditions: Analytical balances are sensitive to environmental factors such as temperature, humidity, air currents, and vibrations, which can affect the accuracy of measurements. Therefore, they are often used in controlled laboratory environments with stable conditions.
- Applications: Analytical balances are used in various scientific disciplines, including chemistry, biology, pharmaceuticals, environmental science, and materials science, for tasks such as weighing reagents, preparing solutions, analyzing samples, and conducting experiments.
- Handling: To maintain accuracy and prevent contamination, users must handle samples and weights carefully when using an analytical balance. This includes using clean weighing vessels, avoiding contact with hands or other objects, and minimizing air turbulence in the weighing chamber.
- Safety: Analytical balances are delicate instruments that require careful handling to avoid damage. Users should follow safety precautions and operating instructions provided by the manufacturer to prevent accidents and ensure the longevity of the instrument.
- An analytical balance is a precision measuring instrument used in laboratories to determine the mass of substances with high accuracy and precision.
- analytical balances are essential tools for quantitative analysis in scientific research, quality control, and regulatory compliance, providing reliable measurements for critical laboratory applications.
- Proper Handling: Users must handle samples and weighing vessels with care to prevent contamination and ensure accurate results. Proper technique includes using clean weighing containers, avoiding contact with hands or other objects, and minimizing disturbances in the weighing chamber.
- medications applied to the skin or mucous membranes, such as creams, ointments, gels, or patches, for localized treatment of conditions like rashes, infections, or pain.
- Inhaled Medications: These are medications delivered directly to the lungs through inhalation devices, often used to treat respiratory conditions like asthma, chronic obstructive pulmonary disease (COPD), or cystic fibrosis.

In pharmaceutical companies, "medicine" refers to the specific pharmaceutical products or drugs that are researched, developed, manufactured, and distributed to healthcare providers and patients. These medicines are typically formulated to treat, manage, or prevent various diseases, conditions, or health issues. Pharmaceutical companies invest heavily in the discovery and development of new medicines through rigorous research and clinical trials to ensure their safety, efficacy, and regulatory approval before they are made available to the public.

Instrument used in pharmaceutical industry

- **Analytical Balance**

Accuracy and Precision: Analytical balances are designed to provide highly accurate and precise measurements, often with readability to several decimal places (e.g., milligrams or micrograms). They are capable of measuring small masses with sensitivity and reliability.

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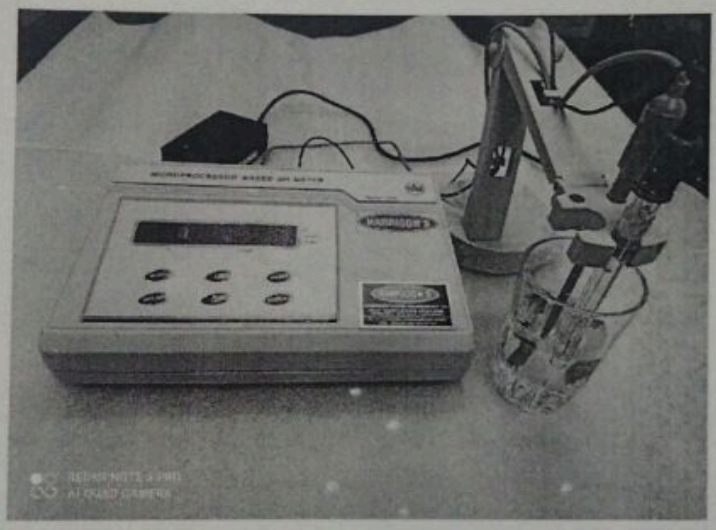
- ***Digital PH Meter***



A digital pH meter is a scientific instrument used to measure the acidity or alkalinity of a liquid solution. Here's how it works and some key features:Principle of Operation: A digital pH meter measures the concentration of hydrogen ions (H^+) in a solution, which determines its pH value. The meter consists of a glass electrode and a reference electrode immersed in the solution.

- pH Range: Digital pH meters can typically measure pH values across a wide range, from highly acidic (pH 0) to highly alkaline (pH 14), with neutral pH at 7.0. Some meters may have a narrower pH range depending on their intended application.
- Calibration: Calibration is essential for ensuring the accuracy of a digital pH meter. Meters are calibrated using buffer solutions with known pH values (e.g., pH 4.01, 7.00, and 10.01) to adjust the meter's readings accordingly. Calibration should be performed regularly, especially before critical measurements.

Applications:

Digital pH meters are widely used in various industries and scientific disciplines, including agriculture, environmental monitoring, water treatment, food and beverage production, pharmaceuticals, and laboratory research. They are essential tools for ensuring the quality and consistency of products and processes where pH control is critical.

A digital pH meter measures the concentration of hydrogen ions (H^+) in a solution, which determines its pH value. The meter consists of a glass electrode and a reference electrode immersed in the solution. When the electrodes come into contact with the solution, they generate a voltage proportional to the hydrogen ion concentration, which is converted into pH units by the meter.

advantages:

- Accuracy
- Speed
- Ease of Use
- Wide range

A digital pH meter is a scientific instrument used to measure the acidity or alkalinity of a liquid solution.

- ***UV Visible Spectrophotometer***

A UV spectrophotometer is a device used to measure the absorbance of ultraviolet (UV) light by a substance. It's commonly used in various fields like chemistry, biochemistry, and environmental science to analyze the concentration of substances that absorb UV light.

Advantages

- Versatility: They can measure absorbance over a wide range of wavelengths, typically from ultraviolet (UV) to visible light, allowing analysis of various compounds and substances.
- Sensitivity: UV-visible spectrophotometers are highly sensitive, capable of detecting low concentrations of substances, making them useful in analytical chemistry and biochemistry.
- Quantitative Analysis: They enable quantitative analysis by measuring the absorbance of a sample at specific wavelengths, which can be correlated with concentration using Beer-Lambert's law.
- Speed: Modern UV-visible spectrophotometers are often equipped with automation features and advanced software, allowing for rapid data collection and analysis.

Limitations

- Sample Preparation: Sample preparation is often required to ensure accurate measurements, which can be time-consuming and may introduce errors.
- Calibration: Regular calibration is necessary to maintain accuracy and reliability. Without proper calibration, results may be inaccurate.
- Limited Quantitative Range: The quantitative range of UV-visible spectrophotometers may be limited by factors such as the sensitivity of the detector and the linearity of the instrument's response.
- Spectral Overlap: Spectral overlap of absorption bands can make it challenging to distinguish between different substances in a complex mixture.
- Cost: High-quality UV-visible spectrophotometers can be expensive to purchase and maintain, making them less accessible to some laboratories or research facilities.

A UV spectrophotometer is a device used to measure the absorbance of ultraviolet (UV) light by a substance. It's commonly used in various fields like chemistry, biochemistry, and environmental science to analyze the concentration of substances that absorb UV light.

- **IR Spectroscopy**

Infrared (IR) spectroscopy is a technique used to analyze the chemical composition of substances based on the absorption of infrared radiation. It measures the wavelengths of light absorbed by a sample, which can provide information about its molecular structure and functional groups. IR spectroscopy is widely used in chemistry, biochemistry, pharmaceuticals, materials science, and forensic analysis, among other fields, for qualitative and quantitative analysis of organic and inorganic compounds.

IR spectroscopy works on the principle that molecules absorb specific frequencies of infrared radiation corresponding to the vibrational modes of their chemical bonds. When infrared light passes through a sample, some wavelengths are absorbed, while others are transmitted. The

resulting spectrum, called an IR spectrum, provides valuable information about the types of bonds present in the sample.

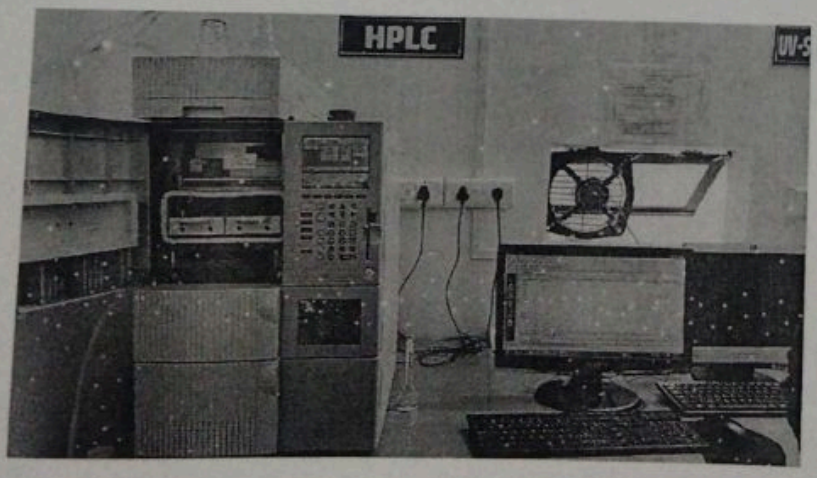
IR spectroscopy is used for a wide range of applications, including structural elucidation of organic and inorganic compounds, identification of functional groups, determination of molecular conformation, analysis of polymers and plastics, quality control in pharmaceutical and chemical industries, forensic analysis, and environmental monitoring.

- ***HPLC (High Paper Liquid Chromatography)***

HPLC separates components of a mixture based on their interaction with a stationary phase and a mobile phase. The sample is injected into the system and carried through a column packed with a stationary phase by a solvent (mobile phase). Components in the sample interact differently with the stationary phase, causing them to separate and elute from the column at different times.

Components:

- Column: The column is the heart of the HPLC system and contains the stationary phase where separation occurs. Columns vary in size, material, and stationary phase chemistry depending on the application.
- Pump: The pump delivers the mobile phase at a constant flow rate through the column.
- Injector: The injector introduces the sample into the mobile phase stream.
- Detector: The detector measures the concentration of analytes as they elute from the column. Common detectors include UV-Vis, fluorescence, and mass spectrometry detectors.
- Data System: The data system collects and processes the signals from the detector, allowing for analysis and quantification of the separated components.



Modes of Separation: HPLC can perform various modes of separation, including:

- Normal Phase: The stationary phase is polar (e.g., silica) and the mobile phase is nonpolar (e.g., hexane).

- Reverse Phase: The stationary phase is nonpolar (e.g., C18) and the mobile phase is polar (e.g., water/acetonitrile).
- Ion Exchange: Separates charged species based on their interaction with charged groups on the stationary phase.
- Size Exclusion: Separates molecules based on their size and shape.

Advantages:

- HPLC offers high resolution, sensitivity, and reproducibility. It can analyze a wide range of compounds, from small molecules to large biomolecules.

Limitations:

- HPLC requires expensive equipment and consumables, and the analysis can be time-consuming. Some compounds may require optimization of separation conditions, and volatile analytes may be lost during the process.

- **Gas Chromatography**

Gas Chromatography (GC) is a chromatographic technique used to separate and analyze volatile compounds in a mixture. Here's some information about gas chromatography:

Principle:

Gas chromatography separates components of a mixture based on their distribution between a stationary phase (typically a liquid or solid adsorbed on a solid support) and a mobile phase (an inert gas like helium or nitrogen).

The sample is vaporized and injected into a heated column, where it interacts with the stationary phase and is carried through the column by the mobile phase.

Components with different affinities for the stationary phase will travel through the column at different rates, leading to separation.

Modes of Separation:

- Gas chromatography can perform various modes of separation, including:
- Gas-Solid Chromatography (GSC): Uses a solid stationary phase.
- Gas-Liquid Chromatography (GLC): Uses a liquid stationary phase coated on the column walls.
- Capillary GC: Employs a capillary column with a very thin film of stationary phase for higher resolution and sensitivity.

Applications:

Gas chromatography is widely used in analytical chemistry, forensics, environmental analysis, pharmaceuticals, petrochemicals, food and beverage analysis, and many other fields for qualitative and quantitative analysis of volatile and semi-volatile compounds.

Advantages:

GC offers high resolution, sensitivity, and speed of analysis. It can separate a wide range of compounds, from small molecules to large biomolecules. Additionally, it allows for the identification and quantification of individual components in complex mixtures.

Limitations:

GC requires volatile or semi-volatile analytes, and non-volatile compounds must be derivatized before analysis. It also requires expensive equipment and consumables and may require optimization of separation conditions for different compounds.

gas chromatography is a powerful analytical technique used for the separation and analysis of complex mixtures of volatile compounds.

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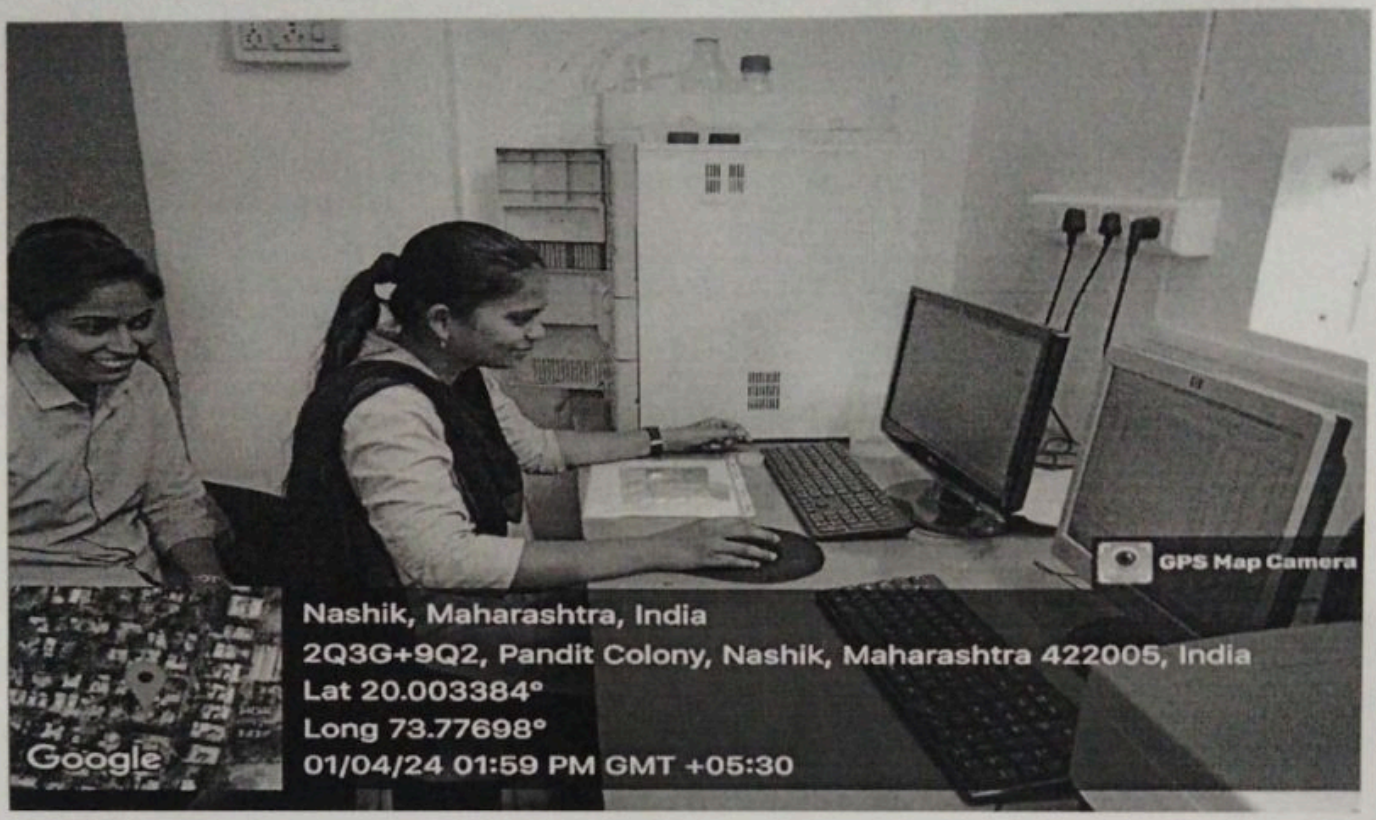
Department of Chemistry
SNJB's KKHA Arts, SMGL Commerce and SPHJ Science College, Chandwad
Dist- Nashik, Maharashtra- PIN-423 101
(DST-FIST Funded December-2018)
(02556) Off. 252125 Res.252126 Tel. Fax: 02556-252125
P. O. Box No.: 6 • E-mail: alccchandwad@yahoo.co.in
Website: www.acschandwadcollege.com
Dr. R. S. Sancheti (Head, Dept. of Chemistry)
E-mail: sanchet83@gmail.com

Date . 10/04/2024

A Report on "On Job Training"

Our college has organized "On Job Training "program according to SPPU, Pune Curriculum" for MSc. I Students in two sessions (theoretical & hands on training). In these two sessions hands on training was given to the student on Ultraviolet, Fourier Transform Infrared, Spectroscopic techniques Gas & High Performance Liquid Chromatography .

In theoretical session Mr. Masum Deshmukh has given talks on Ultraviolet, Fourier Transform Infrared, Gas Chromatography & High Performance Liquid Chromatography instrumental techniques. While hands on training was also given on ultraviolet & High Performance Liquid Chromatography. In these two-session total 67 students were participated & Certificates of the same was provided to the students.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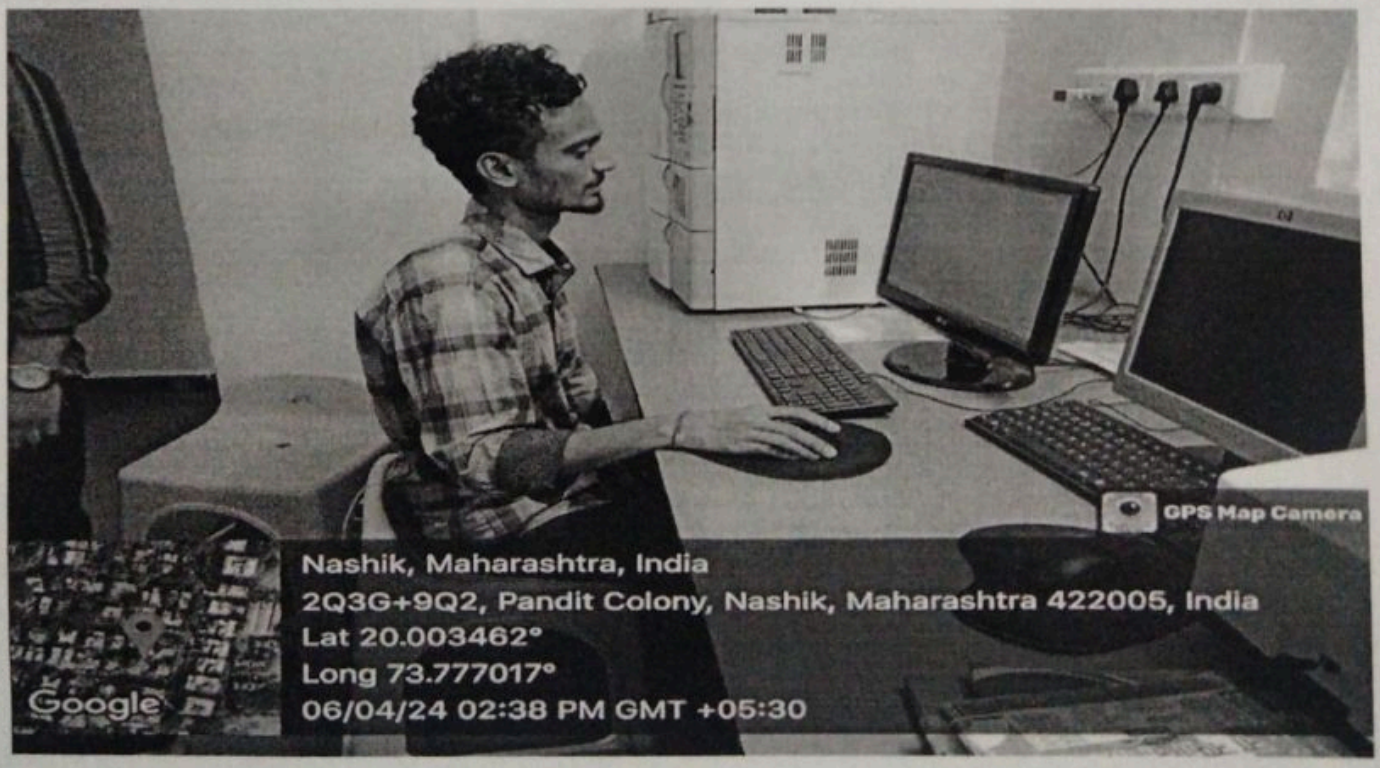
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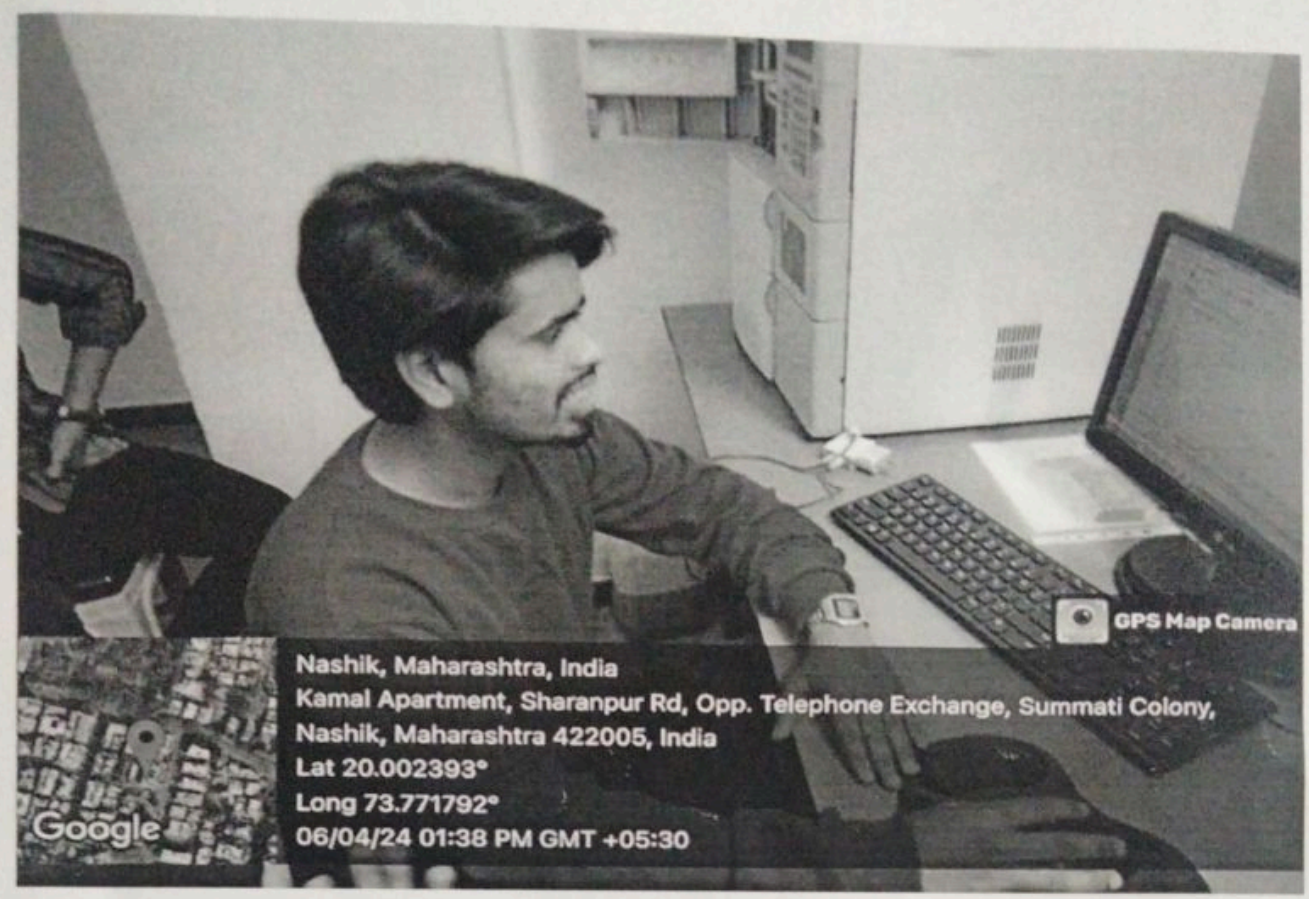
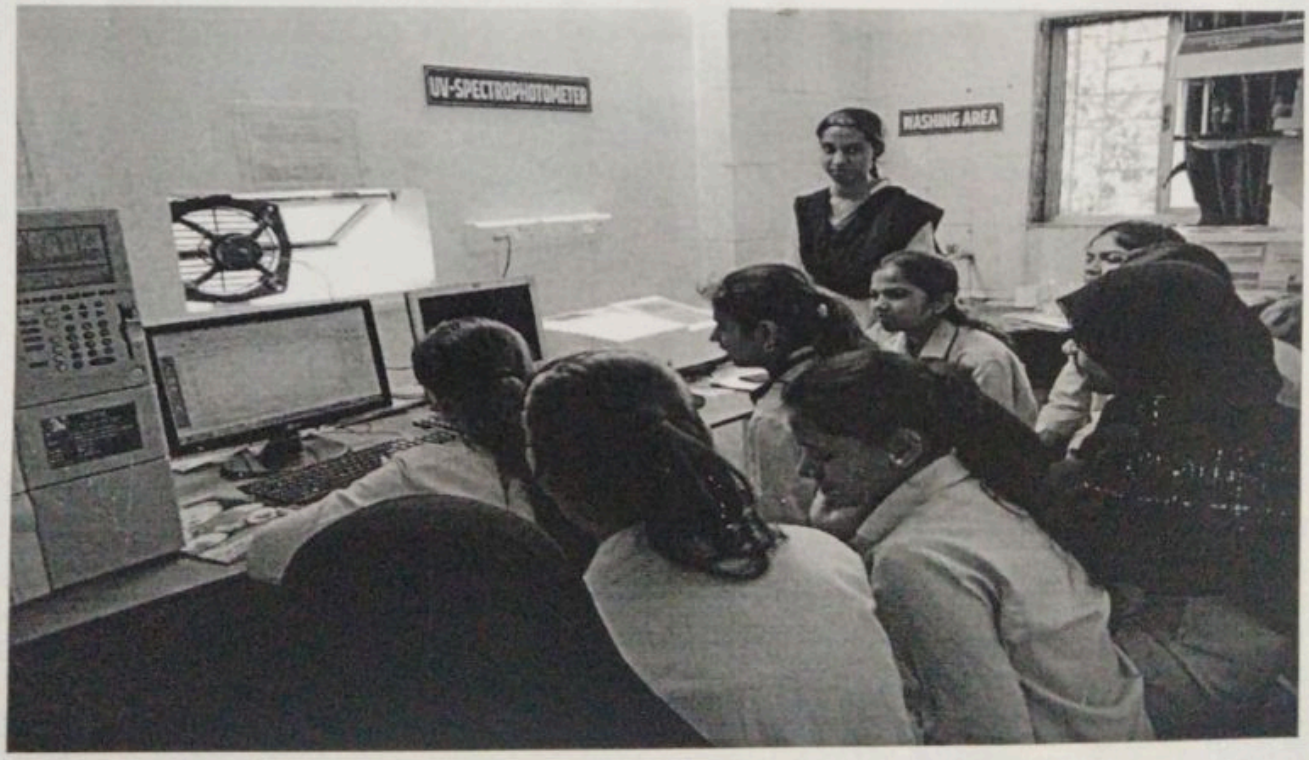
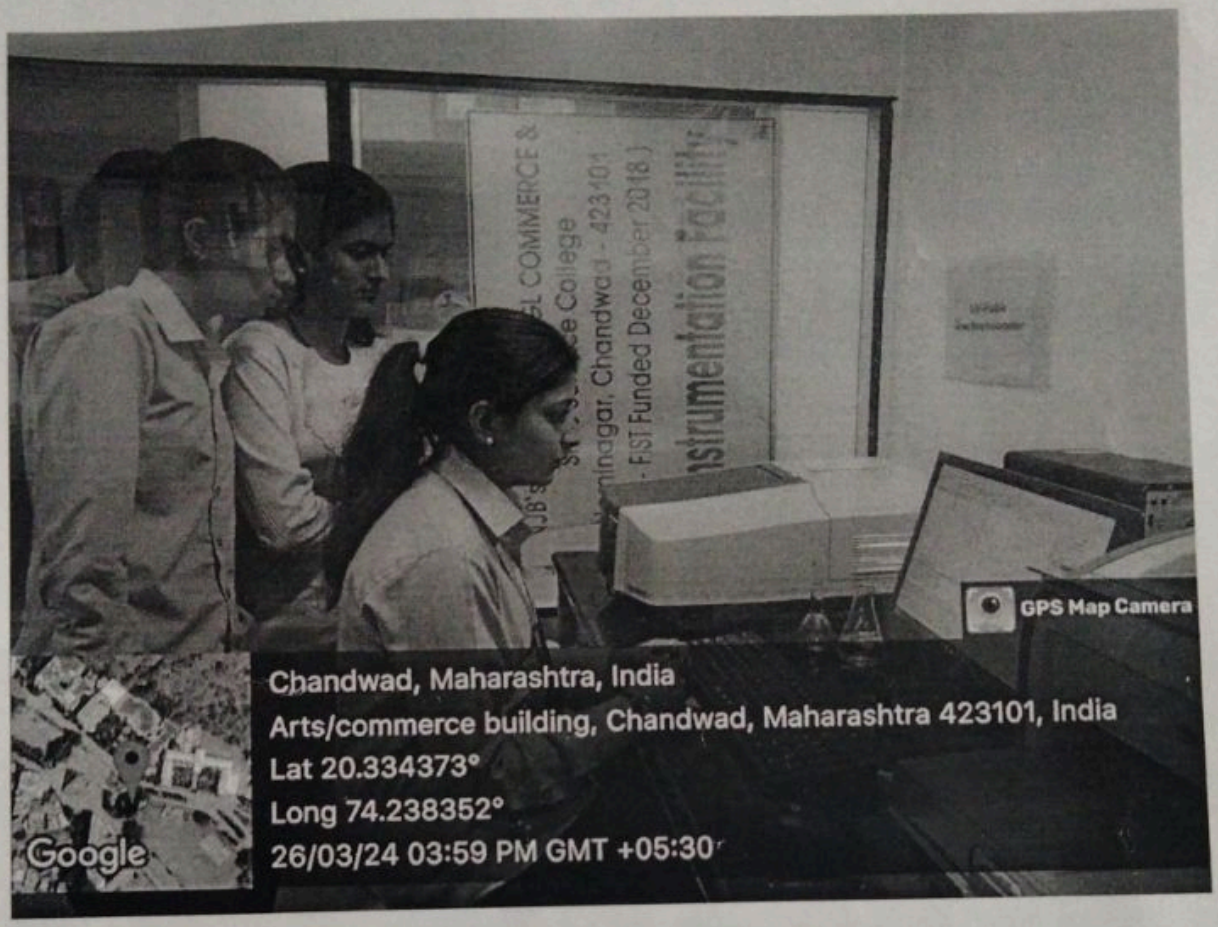




Hands on training of HPLC by our students



Hands on training of ultraviolet by our students

Coordinator

HOD & Coordinator

Department of Chemistry
SNJB's K.K.H.A.Arts, S.M.G.L.Comm. & S.P.H.J.Science College,
Chandwad-423 101 Dist- Nashik

IQAC COORDINATOR
Internal Quality Assessment Cell
SNJB's K.K.H.A.Arts, S.M.G.L. Commerce & S.P.H.J. Science College,
Chandwad-423 101 Dist-Nashik

PRINCIPAL
K.K.H.A. Arts SMGL Comm. & SPHJ Science (Senior) & S.P.D.S. Arts, Comm. & Science (Junior) College, Chandwad, Dist. Nashik - 423 101