

Central Instrumentation Facility (CIF) at Thiruvalluvar University



Central Instrumentation Facility

Excellence in teaching and research by Science Departments need state-of-the-art sophisticated equipments, various workshops and support facilities. The Central Instrumentation Facility (CIF) has been established at the Thiruvalluvar University, Vellore that acquires, maintains sophisticated analytical equipments all under one roof and provides service to the R & D projects of academic institutions and industries. These equipments and facilities help the faculty, research scholars and students to carry out globally competitive R & D in basic and applied sciences.

CIF was started in Thiruvalluvar University with a mission to enrich the resources on a shared basis for promoting R and D with the following objectives.

1. To provide guidance for acquisition of data and train personnel in operation and maintenance of Sophisticated Instruments.
2. To strengthen technological infrastructure to carry out advanced research in various science disciplines under one roof and make their services available to academic schools and departments.
3. To organize short-term courses/workshops on the use and application of various spectroscopic and analytical techniques for students, teachers and technical personnel from our University, affiliated institutions, universities and industry in the region.

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High Performance Liquid Chromatography (HPLC)

JASCO UV-4075



Advantages of HPLC

- ✓ Separations fast and efficient (high-resolution power)
- ✓ Continuous monitoring of the column effluent
- ✓ It can be applied to the separation and analysis of very complex mixtures
- ✓ Accurate quantitative measurements.
- ✓ Repetitive and reproducible analysis using the same column.
- ✓ Adsorption, partition, ion exchange and exclusion column separations are excellently made.
- ✓ HPLC is more versatile than GLC in some respects because it has the advantage of not being restricted to volatile and thermally stable solute and the choice of mobile and stationary phases is much wider in HPLC
- ✓ Both aqueous and non-aqueous samples can be analyzed with little or no sample pre-treatment
- ✓ A variety of solvents and column packing are available, providing a high degree of selectivity for specific analyses.
- ✓ It provides a means for the determination of multiple components in a single analysis.

Applications of HPLC

The main purpose of the HPLC technique is to identify, quantify and purify a particular analyte or compound. Both quantitative and qualitative analysis can be done. HPLCs can be used in the following applications:

- **Pharmaceutical Applications**

To control drug stability.

Tablet dissolution study of pharmaceutical dosages form.

Pharmaceutical quality control.

- **Environmental Applications**

Detection of phenolic compounds in drinking water.

Bio-monitoring of pollutants.

- **Applications in Forensics**

Quantification of drugs in biological samples.

Identification of steroids in blood, urine etc.

Forensic analysis of textile dyes.

- **Food and Flavour**

Measurement of Quality of soft drinks and water.

Sugar analysis in fruit juices.

Analysis of polycyclic compounds in vegetables.

Preservative analysis.

- **Applications in Clinical Tests**

Urine analysis, antibiotics analysis in blood.

Analysis of bilirubin, biliverdin in hepatic disorders.

Detection of endogenous Neuropeptides in extracellular fluid of brain etc.

Fourier-transform infrared spectroscopy (FTIR)-JASCO4600



Fourier-transform infrared spectroscopy (FTIR)-ParkinElmer



Fourier-transform infrared spectroscopy (FTIR)-JASCO4600



FTIR

- ✓ The speed of FTIR analysis makes it particularly useful in screening applications, while the sensitivity empowers many advanced research applications.
- ✓ While FTIR is frequently used for polymer testing and pharmaceutical and forensic analysis, the application of the technique is virtually limitless, offering both qualitative and quantitative analysis of a wide range of organic and inorganic samples.
- ✓ FTIR spectra reveal the composition of solids, liquids, and gases. The most common use is in the identification of unknown materials and confirmation of production materials (incoming or outgoing).
- ✓ The information content is very specific in most cases, permitting fine discrimination between like materials.
- ✓ Whether you are a new user or an experienced spectroscopist, you can obtain high-quality spectral data to accelerate your research, routine QA/QC testing, or investigative needs.

Electrochemical analyzer (CH Instrument CHIE-608E)



Established the electrochemical techniques, including: potential sweep, step, pulse, alternating current, stripping, and scanning electrochemical microscopy.

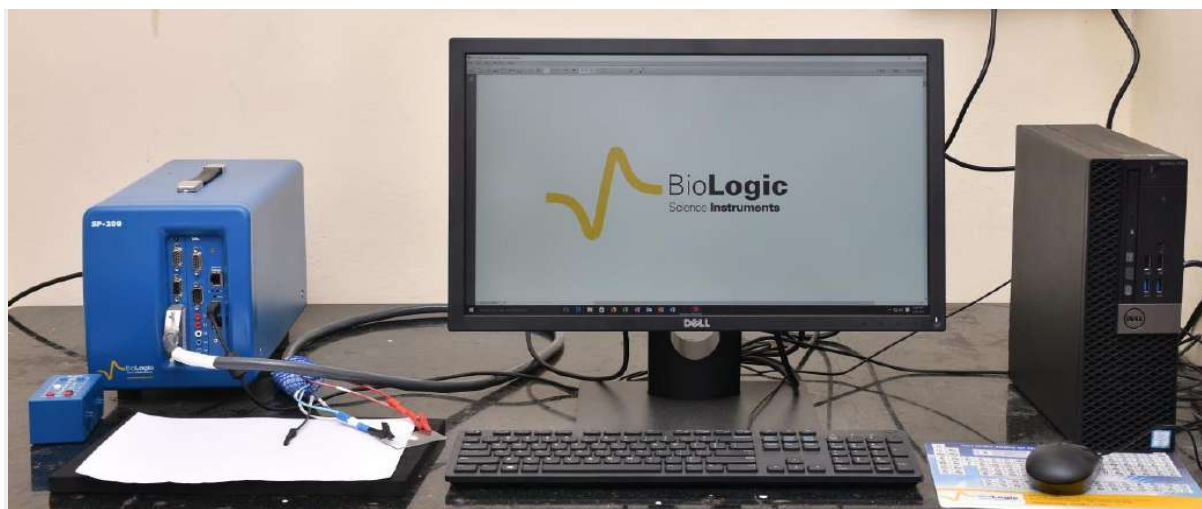
Powerful and intuitive software

- Designed by electrochemists, for electrochemists
- Macro commands for batch experiments
- CV simulation and fitting program
- AC impedance simulation and fitting program
- Interactive 3D graphics

Applications

Battery & intercalation compounds, Battery cycling, Capacitor and supercapacitor, Corrosion & coatings, EIS, Electrochroms, Fundamental electrochemistry, Liquid conductivity, Sensors.

Biologic Science Instruments SP-200

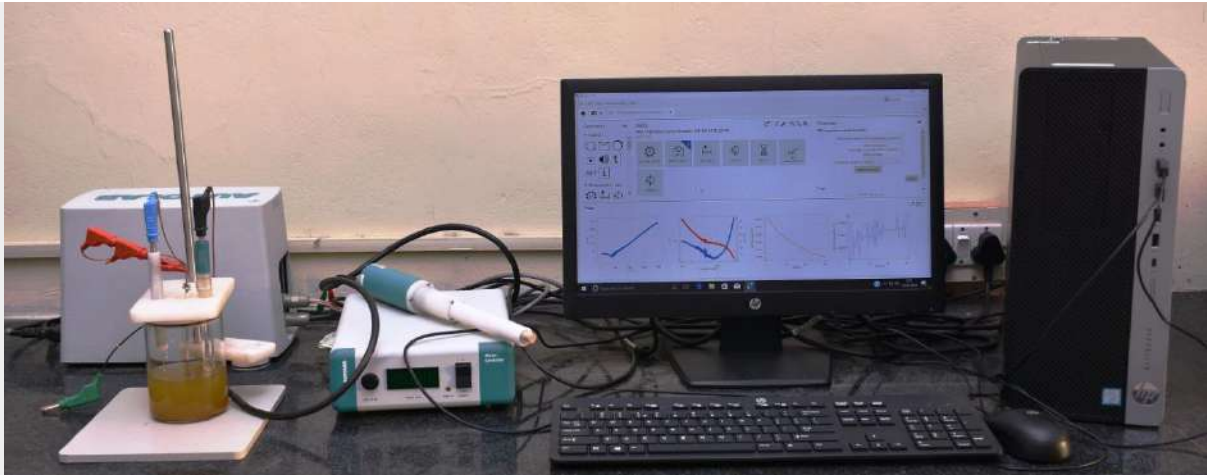


Biologic Science SP-200

- Biological science SP-200 is a 500 mA research grade, value-oriented Potentiostat/Galvanostat. With the 100 fA accuracy ultra low current option, it is the perfect instrument for application in electrochemistry especially corrosion.
- The SP-200 offers a floating mode, analog filtering and a built-in calibration board.
- Additionally, the SP-200 can be purchased with a standard DC potentiostat or an EIS capable one.
- There is also an Ultra Low Current (ULC) option. On-site experiments can be performed thanks to its portable design.

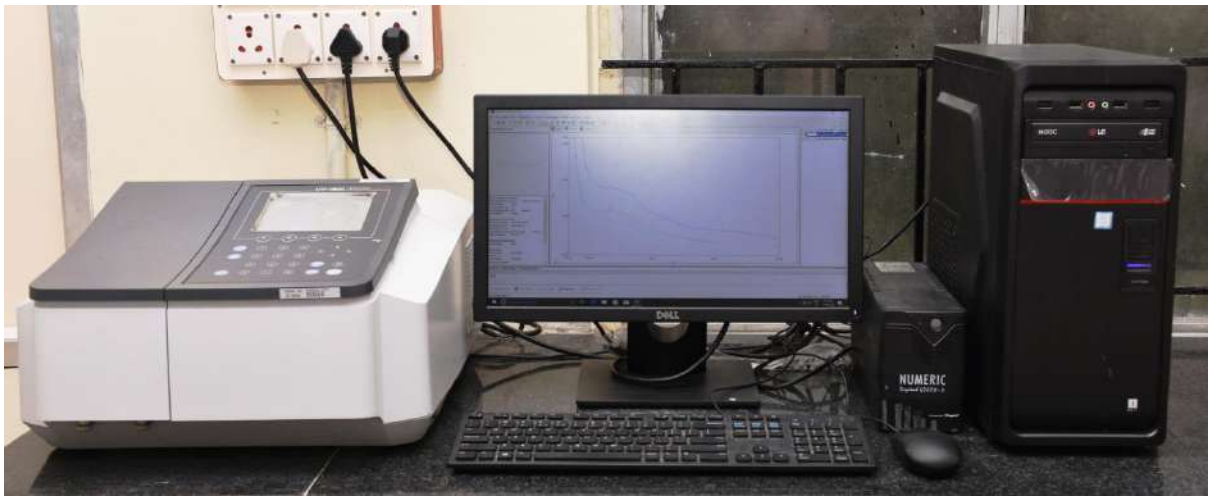
Applications: Battery & intercalation compounds, Battery cycling, Capacitor and supercapacitor, Corrosion & coatings, EIS, Electrochroms, Fuel Cell & Biofuel Cell, Fundamental electrochemistry, Liquid conductivity, Sensors, Topography

Autolab (Potentiostat / Galvanostat with motor controller)



- The **PGSTAT204** combines the small footprint with a modular design. The instrument includes a base potentiostat/galvanostat with a compliance voltage of 20 V and a maximum current of 400 mA.
- The potentiostat can be expanded at any time with one additional module, for example the FRA32M electrochemical impedance spectroscopy (EIS) module.
- Analog and digital inputs/outputs are available to control Autolab accessories and external devices are available. The PGSTAT204 includes a built-in analog integrator.
- In combination with the powerful NOVA software it can be used for most of the standard electrochemical techniques.
- **Applications:** Corrosion & coatings, EIS, Electrochroms, Fuel Cell & Biofuel Cell, Fundamental electrochemistry and Sensors.

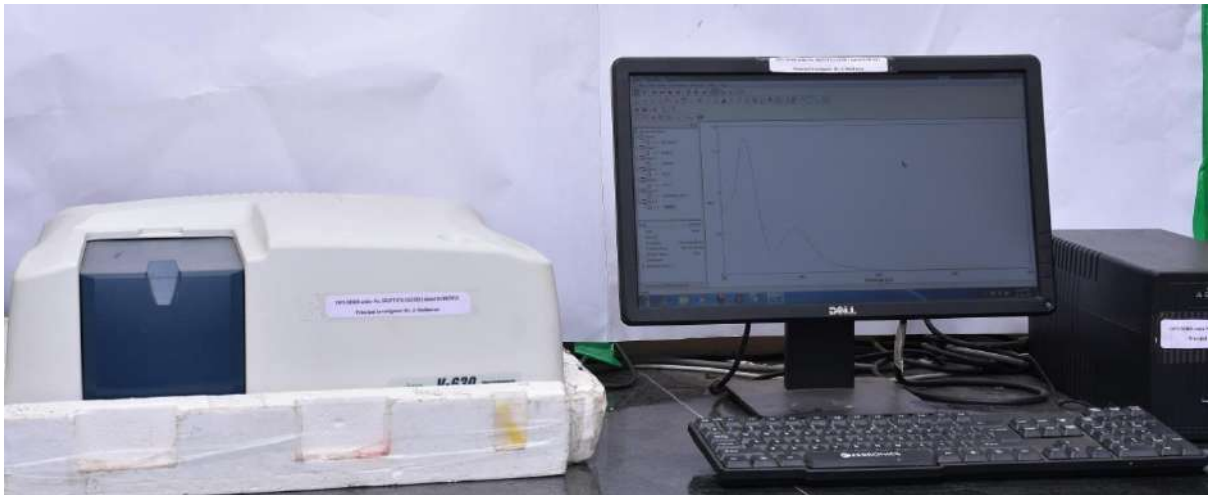
UV-Visible Spectrophotometer (UV-1800 SHIMADZU)



UV-Visible Spectrophotometer (UV-2300 TECHCOMP)



UV-Visible Spectrophotometer (JASCO V-630)



UV-VIS spectrophotometer-UV-2450 (SHIMADZU)



ELICO Double Beam SL210 UV-Visible spectrophotometer



Ultraviolet-visible spectroscopy refers to absorption spectroscopy or reflectance spectroscopy in part of the ultraviolet and the full, adjacent visible spectral regions. The most widely applicable cuvettes are made of high quality fused silica or quartz glass because these are transparent throughout the UV, visible and near infrared regions.

Applications

- UV/Vis spectroscopy is routinely used in analytical chemistry for the quantitative determination of different analytes, such as transition metal ions, highly conjugated organic compounds, and biological macromolecules.
- The reaction, occurring in solution, must present color or brightness shifts from reactants to products in order to use UV/Vis for this application.
- UV/Vis can be applied to determine the kinetics or rate constant of a chemical reaction.

Fluorescence spectrophotometer LS45 (PerkinElmer)



In **fluorescence spectrometry** both an excitation spectrum (the light that is absorbed by the sample) and/or an emission spectrum (the light emitted by the sample) can be measured. The concentration of the analyte is directly proportional with the intensity of the emission.

- Fluorescence analysis is suitable for analytes that can be dissolved in solvents like water, ethanol and hexane.
- The analytes need to absorb UV or visible light.
- The analytes need to emit visible or near infra red radiation
- With fluorescence analysis we can do quantitative measurements of a single analyte in solution (Or more than one analytes in solution provided they do not interfere with each other.)

Magnus Inverted tissue culture Trinocular Microscope



Inverted microscopes for biological tissue culture applications. Plan infinity optics with long working distance objectives. Trinocular head for fitting documentation cameras. Available are a number of attachments to increase versatility of the microscope.

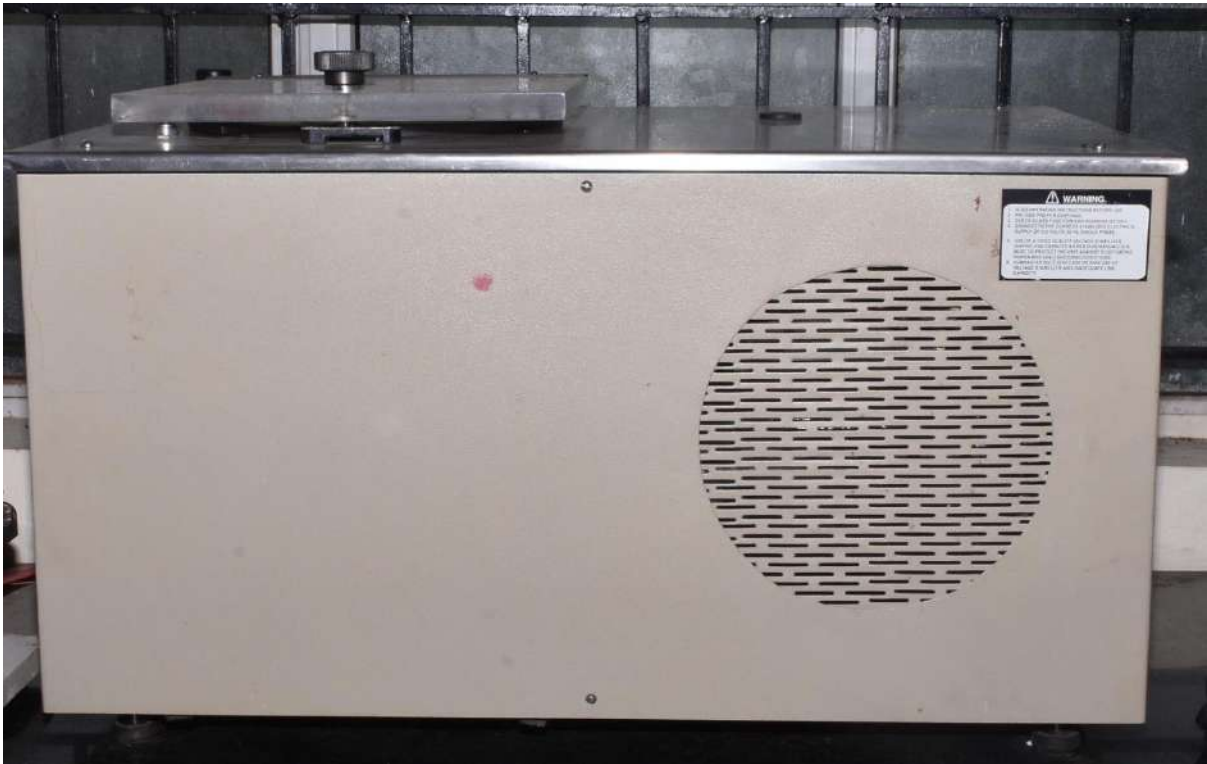
Features:

- Long working distance plan infinity optics
- Pre-centered phase annulus
- Trinocular port in standard unit
- Excellent field flatness

Uses:

- Tissue Culture applications.
- Auto immune diseases identification.
- Cell Culture Studies.
- Microscope cameras with advance CMOS sensors.
- Multifunctional camera with High Resolution.

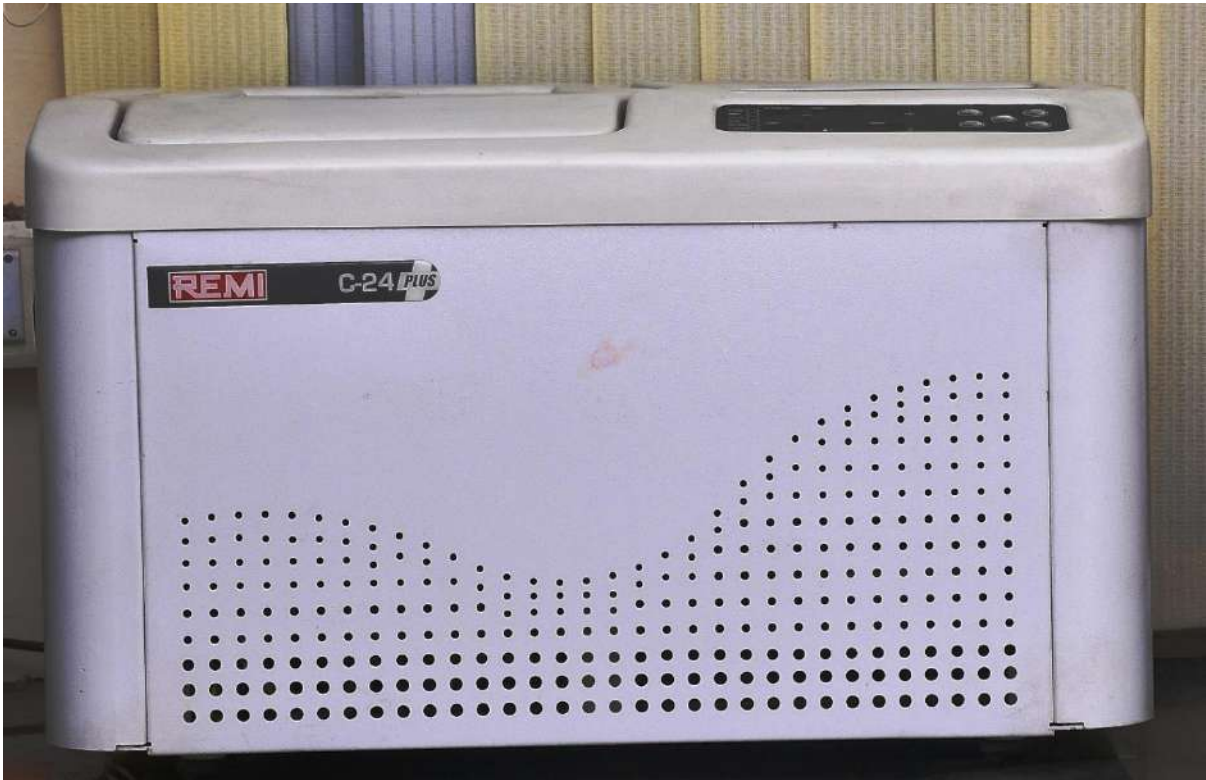
Cooling Centrifuge (REMI)



Cooling Centrifuge (REMI-24plus)



Cooling Centrifuge (REMI-24plus)



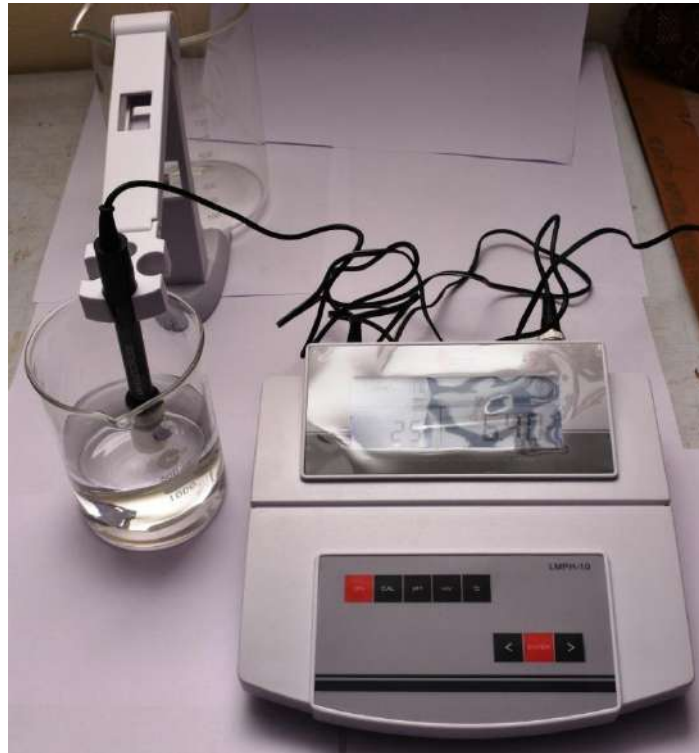
Application:

- Use in haematology lab for PCV determination.
- Isolation of macromolecules such as DNA, RNA, proteins, or lipids
- Removes protein precipitate from analytic sample.
- Conc. Cellular element for microscopy.
- Remove cellular elements from blood to provides cell-free serum or plasma

Deluxe pH meter model-101



pH meter LMPH-10



- A **pH meter** is a scientific instrument that measures the hydrogen-ion activity in water-based solutions, indicating its acidity or alkalinity expressed as pH.
- pH meters are used for soil measurements in agriculture, water quality for municipal water supplies, swimming pools, environmental remediation; brewing of wine or beer; manufacturing, healthcare and clinical applications such as blood chemistry; and many other applications.

REMI Centrifuge (R-8C)



REMI mini Centrifuge (RM-20 plus)



PCR Mini centrifuge - SPINWIN



- This equipment is extensively used in chemistry, biology, and biochemistry for isolating and separating suspensions.
- It additionally provides the cooling mechanism to maintain the uniform temperature throughout the operation of the sample.

Laminar air cabinet -Cleanair-CAB900



Laminar air cabinet (MANISH)



Laminar air cabinet (C-TECH instrument)



A **laminar flow cabinet** or **tissue culture hood** is a carefully enclosed bench designed to prevent contamination of semiconductor wafers, biological samples, or any particle sensitive materials.

- Air is drawn through a HEPA filter and blown in a very smooth, laminar flow towards the user.
- Due to the direction of air flow, the sample is protected from the user but the user is not protected from the sample.
- Laminar flow cabinets may have a UV-C germicidal lamp to sterilize the interior and contents before usage to prevent contamination of experiment.
- Germicidal lamps are usually kept on for 15 minutes to sterilize the interior and no contact is to be made with a laminar flow hood during this time.
- During this time, scientists normally prepare other materials to maximize efficiency. (It is important to switch this light off during use, to limit exposure to skin and eyes as stray ultraviolet light emissions can cause cancer and cataracts.

Fume cupboard (AEROMECH)



A fume hood is typically a large piece of equipment enclosing five sides of a work area, the bottom of which is most commonly located at a standing work height. Two main types exist, ducted and recirculating (ductless). The principle is the same for both types: air is drawn in from the front (open) side of the cabinet, and either expelled outside the building or made safe through filtration and fed back into the room.

This is used to:

- Protect the user from inhaling toxic gases (fume hoods, biosafety cabinets, glove boxes)
- Protect the product or experiment (biosafety cabinets, glove boxes)
- Protect the environment (recirculating fume hoods, certain biosafety cabinets, and any other type when fitted with appropriate filters in the exhaust airstream)

Secondary functions of these devices may include explosion protection, spill containment, and other functions necessary to the work being done within the device.

Gel documentation system (Biotech)



A gel doc, also known as a gel documentation system, gel image system or gel imager, refers to equipment widely used in molecular biology laboratories for the imaging and documentation of nucleic acid and protein suspended within polyacrylamide or agarose gels.

- These gels are typically stained with ethidium bromide or other nucleic acid stains such as Gel Green. Generally, a gel doc includes an ultraviolet (UV) light transilluminator, a hood or a darkroom to shield external light sources and protect the user from UV exposure, and a CMOS camera for image capturing.
- Recently produced imager models also include features to handle a variety of fluorescence and chemiluminescence with cameras cooled to -28 to -60 °C.
- Other advanced features include instant printing on-board the camera and Wi-Fi connectivity for control by smartphone and tablet devices.

Hot air oven



Hot air ovens are electrical devices which use dry heat to sterilize. They were originally developed by Pasteur. Generally, they use a thermostat to control the temperature. Their double walled insulation keeps the heat in and conserves energy, the inner layer being a poor conductor and outer layer being metallic.

- ✓ There is also an air filled space in between to aid insulation. An air circulating fan helps in uniform distribution of the heat.
- ✓ These are fitted with the adjustable wire mesh plated trays or aluminium trays and may have an on/off rocker switch, as well as indicators and controls for temperature and holding time.
- ✓ Temperature sensitive tapes or biological indicators using bacterial spores can be used as controls, to test for the efficacy of the device during use.

Hydraulic press



A **hydraulic press** is a machine press using a hydraulic cylinder to generate a compressive force. The hydraulic press depends on Pascal's principle-the pressure throughout a closed system is constant. One part of the system is a piston acting as a pump, with a modest mechanical force acting on a small cross-sectional area; the other part is a piston with a larger area which generates a correspondingly large mechanical force. Only small-diameter tubing (which more easily resists pressure) is needed if the pump is separated from the press cylinder.

- ✓ Hydraulic presses are commonly used for forging, clinching, moulding, blanking, punching, deep drawing, and metal forming operations.
- ✓ The hydraulic press is advantageous in manufacturing, it gives the ability to create more intricate shapes and can be economical with materials.

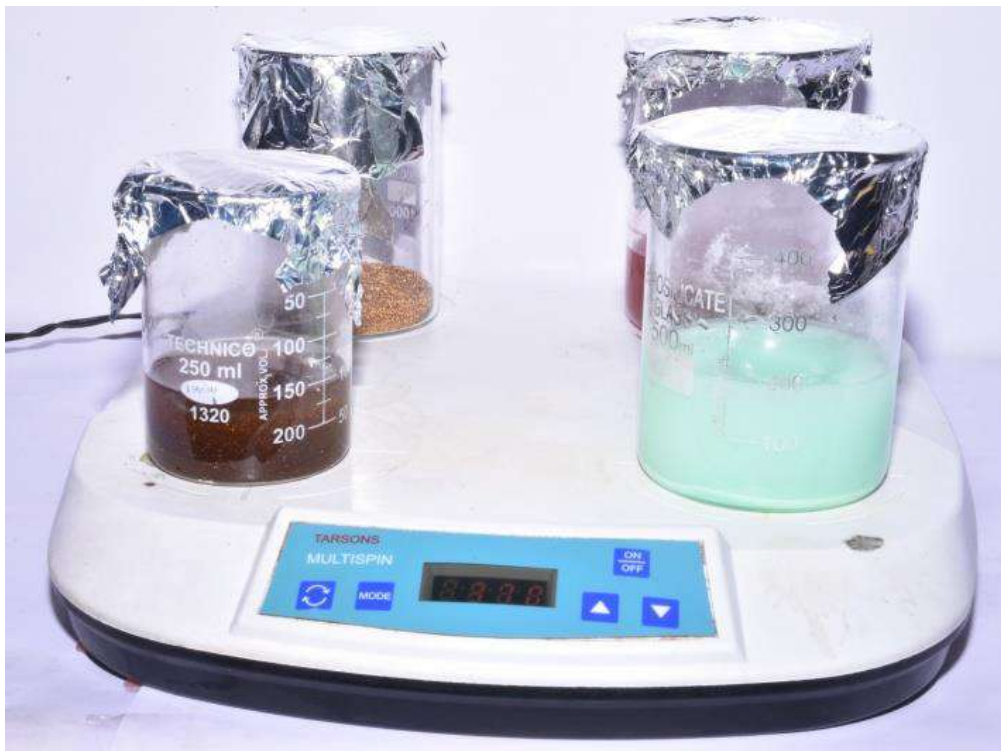
Microscope-ACCU-SCOPE



Microscopy is the science of investigating small objects and structures using such an instrument. Microscopic means invisible to the eye unless aided by a microscope.

- There are many types of microscopes, and they may be grouped in different ways. One way is to describe the way the instruments interact with a sample to create images, either by sending a beam of light or electrons to a sample in its optical path, or by scanning across, and a short distance from the surface of a sample using a probe.
- The most common microscope (and the first to be invented) is the optical microscope, which uses light to pass through a sample to produce an image.
- This microscope technique made it possible to study the cell cycle in live cells.

Multispin (Tarson)



Magnetic stirrer (SPINOT-Tarson)



Digital HOT plate with magnetic stirrer (SPINOT-Tarson)



REMI 1MLH



REMI 5MLH



- The magnetic stirrers are also known as magnetic stir plates and quite commonly used for experiments in chemistry and biology.
- They are very useful when you need to mix component, either solids or liquids and get a homogeneous liquid mixture.
- Some of the common samples include bacterial growth media as well as buffer solutions.
- The main function of a stirrer is to agitate the liquid for speeding up the reactions or improving mixtures.

Serological Water bath



A **water bath** is laboratory equipment made from a container filled with heated water. It is used to incubate samples in water at a constant temperature over a long period of time.

- ✓ Utilisations include warming of reagents, melting of substrates or incubation of cell cultures.
- ✓ It is also used to enable certain chemical reactions to occur at high temperature.
- ✓ Water bath is a preferred heat source for heating flammable chemicals instead of an open flame to prevent ignition.
- ✓ Different types of water baths are used depending on application. For all water baths, it can be used up to 99.9 °C.
- ✓ When temperature is above 100 °C, alternative methods such as oil bath, silicone bath or sand bath may be used.

Digital Colony Counter (DEEP VISION)



- ✓ Digital Colony Counter is designed for quick and accurate counting of bacterial and mould colonies in petri dishes.
- ✓ Feature packed and easy to use, this is an indispensable bench top tool for the busy microbiologist.
- ✓ It is designed for rapid and accurate counting of bacterial and mould colonies.

Autoclave (MAHAVIR)



- Used for the sterilization of culture media, and all other materials through which steam can penetrate.
- Employed for glassware; syringes, metal instruments, and paper-wrapped goods
- They are used for general lab work, component and stability testing, core hardening, drying glassware, and sterilizing.

μ P Photocolorimeter (DEEP VISION)



- ✓ The colour of light is the function of its wavelength.
- ✓ It involves the quantitative estimation of colour.
- ✓ Beer-Lambert Law states that the concentration of a solute is proportional to the absorbance.
- ✓ This device is commonly used to determine the concentration of a known solute in a given solution by the application of the Beer-Lambert law.