HC HINDU COLLEGE, DELHI

Non-Recurring Asset

List of Equipment Procured with Support of DBT Star College Scheme

• ph Meter	• Electromagnet with Measuring Unit
• Colorimeter	• Surface Plasmon Resonance Set-up
• Projection Microscope with Phone Mount	• Workstation with Monitor and UPS
• Rotary Flask Shaker	• Arduino Kit with Accessories
• Orbital Incubator Shaker	• Welding Machine
• BOD (Biochemical Oxygen Demand) Incubator	• Switch Board Cutting Machine
• Hot Water Bath	• Transformer Trainer
• Water Distillation Unit	• Electrical Machine Trainer
• Polyacrylamide Gel Electrophoresis (PAGE) Unit	• Working Zig with Magnifier and LED Light
• Biosafety Cabinet	• Multipurpose Cutting Machine
• Digital Conductivity Meter	• Spirometer
• Heating Mantle	• Hygrometer
• Hot Air Oven	• Turbidity Meter
• Laboratory Refrigerator	• Leaf Area Meter
• Magnetic Stirrers	• Weather Meter
• Mechanical Shaker	• Hotplate
• Micro Weighing Balance	• Microscope
• Microwave Oven	• Sphygmomanometer
• Spectrophotometer (UV/Vis)	• PAGE Powerpack
• Ultrasonic Bath (Sonicator)	• Haemometer
• Vacuum Pump	• Haemocytometer
• Vortex Mixer	• Gel Electrophoresis Apparatus
• Digital Storage Oscilloscope	• DO Meter
• Function Generator	

pH Meter

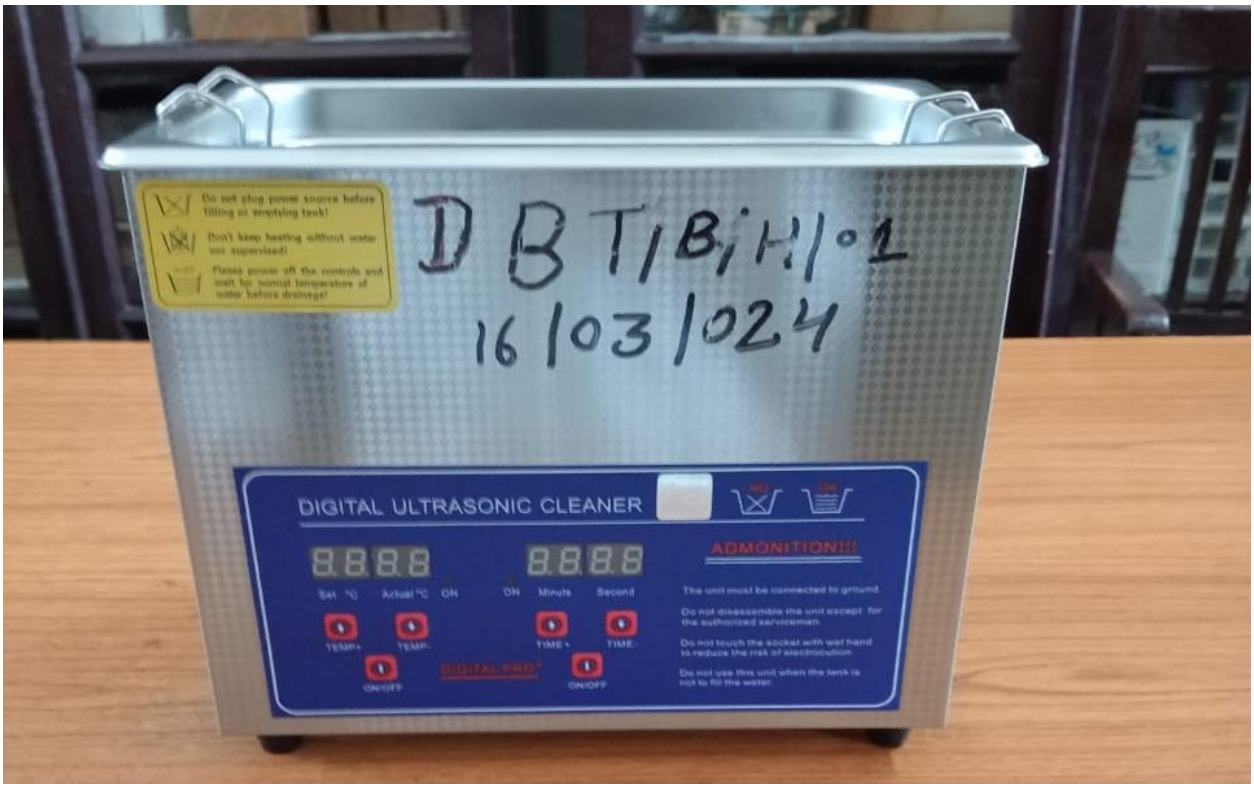
The pH of a solution can be defined as the concentration of hydronium ions in a solution. The pH of the solution is very crucial for biological and chemical analyses. In biological science, it is very important to maintain the pH where one is performing an analysis (eg. Enzyme catalysis), since fluctuation in the pH may lead variations in the results. The pH of a solution can be measured using a pH strip or a pH meter.

Colorimeter

A colorimeter is an instrument that compares the amount of light getting through a solution with the amount that can get through a sample of pure solvent. It is based on the principle that certain compounds in solution possess the ability to absorb particular wavelength of light, when it passes through them. In biological science, the instrument is used in measurements of transmittance and absorbance of biological compounds.

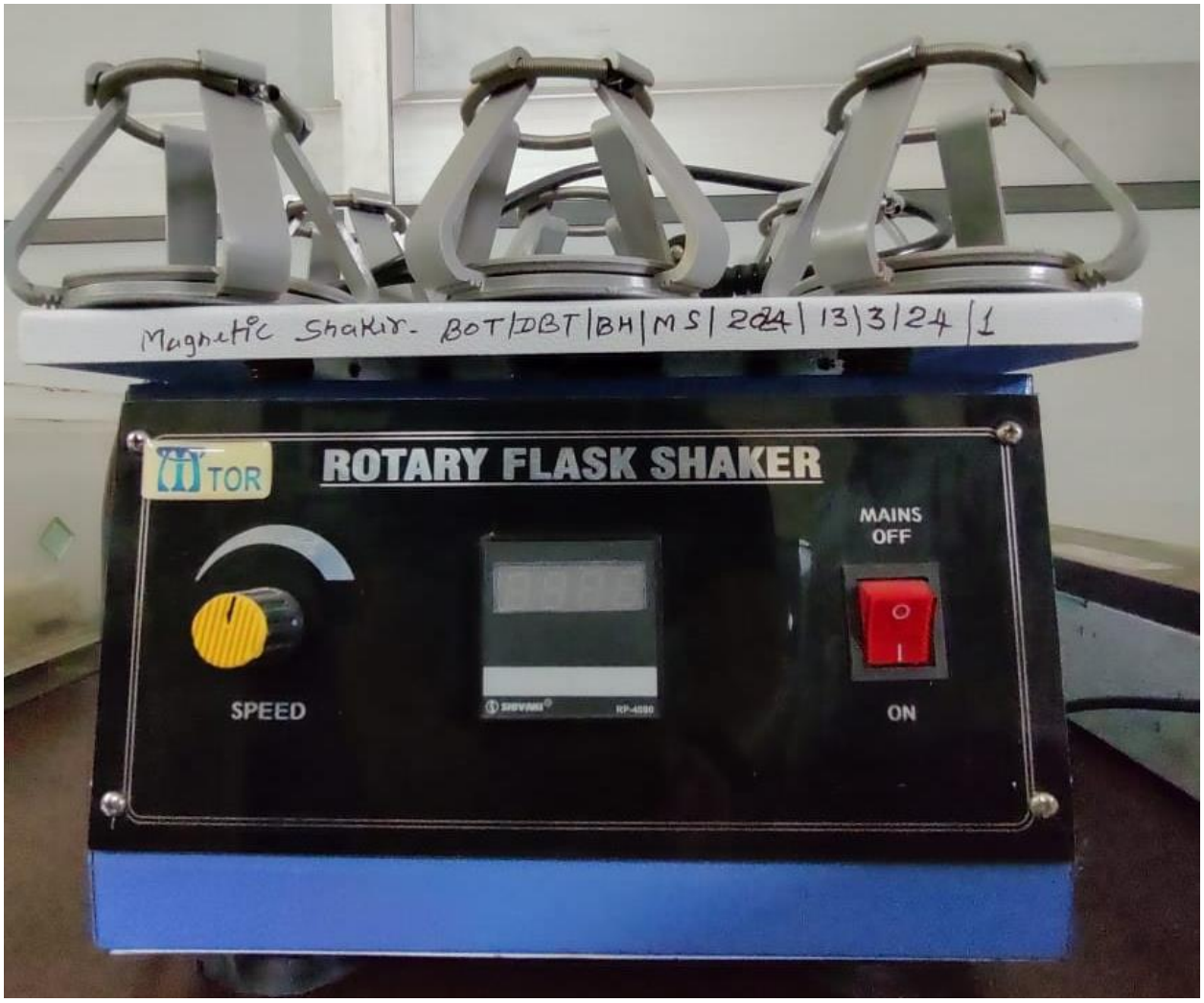
Projection Microscope with Phone Mount

A microscope is a device used to observe minute objects, such as cells and microscopic organisms. The object is magnified through a combination of lens and magnified several folds. A Phone Microscope Attachment is a universal adapter for attaching your mobile phone to a microscope. It connects your phone to your microscope eyepiece or phototube equipped with an eyepiece, so you can view and capture images and video through the eyepiece.



Digital Ultrasonic Cleaner

Ultrasonic cleaners use high frequency wave to create cavitation bubbles in the cleaning liquids. When the ultrasonic cavitation bubbles collapse, they create a cleaning action that can remove debris, dirt, grease, and other deposits from surfaces. The instrument is used to facilitate or enhance the removal of foreign contaminants from surfaces submerged in an ultrasonically activated liquid.



Rotary Flask Shaker

Rotary Flask Shaker is an instrument used for mixing solutions (commonly microbial growth media) used in biological science laboratories. It provides rigorous agitation allowing continuous mixing of solutions and media in flasks or beakers. The instrument has various applications in microbiological, cell culture & other life science experimentations.

Orbital Incubator Shaker

Orbital Incubator Shaker is an instrument used for mixing solutions (commonly microbial growth media) in a controlled temperature environment. They are designed for precise temperature control and simultaneous agitation and mixing that is required for cell and microbial growth, fermentations studies, enzyme reactions, tissue culture and other biotechnology experiments.

BOD (Biochemical Oxygen Demand) Incubator

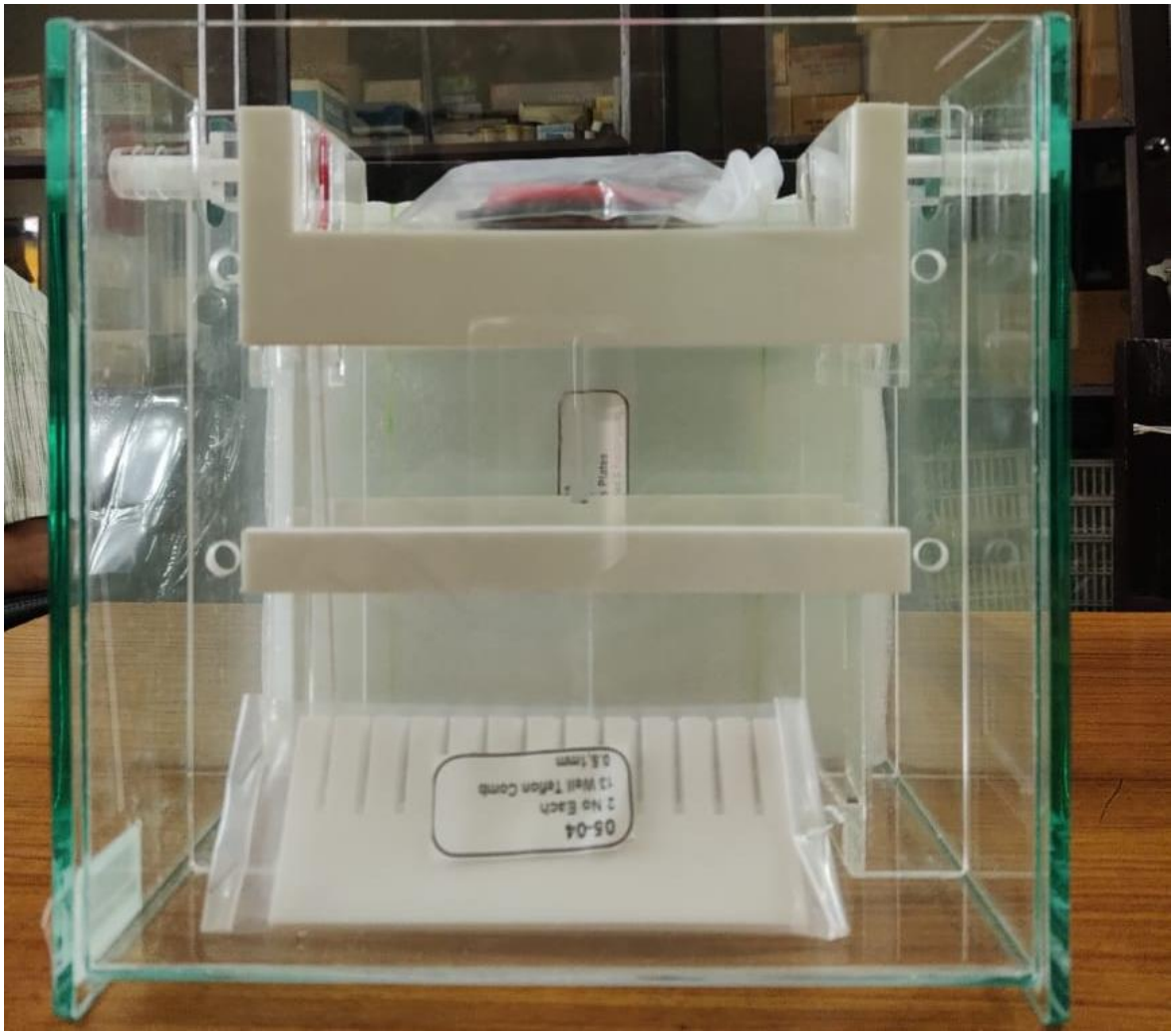
BOD incubator is a specialized laboratory equipment used in measuring the amount of oxygen consumed by microorganisms in water or wastewater samples. They are used in laboratory and research facilities for storage, testing of Bacteria, fungi and other micro-organisms. These incubators detect the amount of dissolved oxygen required by aerobic biological organisms in a body of water. Apart from these, the instrument has various other application, ranging from environmental and industrial monitoring to various biotechnological research.

Hot Water Bath

A water bath is a laboratory equipment that is used to incubate experimental samples at a constant temperature over a long period of time. Water bath is a preferred heat source for heating flammable chemicals instead of an open flame to prevent ignition. Other applications include warming of reagents, melting of substrates, or incubation of cell cultures.

Water Distillation Unit

Water Distillation Unit is an instrument used for distillation of water required for various biological and chemical experimentations. This distilled water is used in various areas of biology, including biochemistry, molecular biology, tissue culture, etc.



Polyacrylamide gel electrophoresis (PAGE) Unit

PAGE is technique used for analysis of proteins in biochemistry, molecular biology biotechnology laboratories. The technique can also be used for separation of nucleic acids. Proteins are analyzed through separation in the gel matrix based on the size and charge of the proteins under study. The unit consist of a glass slabs for casting the gel, buffer tank and power supply system.

Biosafety Cabinet

Biosafety cabinet is a containment instrument used for protection against biohazardous or infectious agents. It also helps maintain aseptic environment while working biological samples. The instrument has various applications in microbiological, cell and tissue culture & other biological science experimentations.

Digital Conductivity Meter

Digital Conductivity Meter is a reliable and accurate test instrument for measurement of Electrical Conductivity (EC) of aqueous solutions. They measure Conductivity and TDS. It is used in various experiments regular and extension experiments.

Heating Mantle

Lab heating mantles are used to uniformly heat various lab and glassware vessels. These are used in various extension experiments, research internships and projects.

Hot Air Oven

A hot air oven is an essential laboratory equipment that uses dry heat (hot air) to sterilize laboratory objects and samples. A hot air oven is generally used for samples that are heat resistant and do not melt, change the form or catch fire on exposure to high temperatures.

Laboratory Refrigerator

Laboratory refrigerator is a very essential equipment. It is used to store samples and chemicals which are temperature sensitive and needed storage and low temperature.

Magnetic Stirrers

The magnetic stirrers are used to agitate liquids to speed up reactions or enhance mixtures. Magnetic Stirrers are commonly used in chemistry and biology experiments for sample preparation and analysis.

Mechanical Shaker

A mechanical shaker is an instrument used to stir or shake liquid or solutions. The device operates on the principle of rotation, combining controlled circular motion with adjustable speed and timing. This functionality allows it to create consistent and homogenous mixing conditions, crucial for a wide range of applications across diverse scientific disciplines.

Micro Weighing Balance

A micro weighing balance is an exceptionally precise instrument used for weighing very small samples with a high degree of accuracy. It is extensively used in various research projects and internships.

Microwave Oven

Microwave oven is used to carry out various reactions using microwave radiation. Microwave radiation has proved to be a highly effective heating source in chemical reactions. Microwaves can accelerate the reaction rate, provide better yields and uniform and selective heating, achieve greater reproducibility of reactions and help in developing cleaner synthetic routes.

Spectrophotometer (UV/Vis)

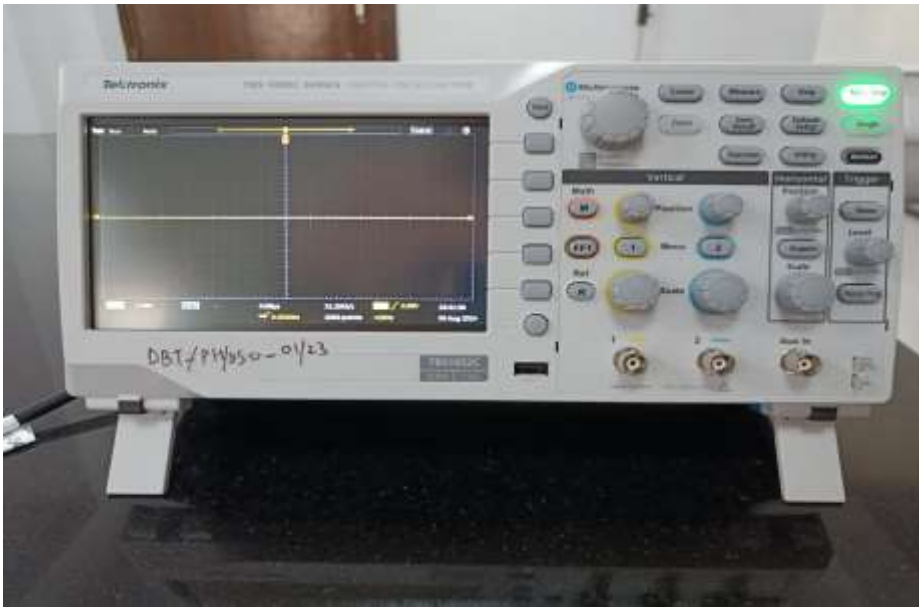
UV-Vis spectrophotometer is a powerful instrument used in various scientific fields to measure light absorbance across the electromagnetic spectrum's ultraviolet (UV) and visible (Vis) ranges. By measuring the intensity of light passing through a sample solution and comparing it to the intensity of the incident light, a UV-Vis spectrophotometer provides valuable information about the properties of materials and their interactions with light.

Ultrasonic Bath (Sonicator)

Sonicators are high-frequency tools (20 kHz) that use ultrasonic energy to agitate particles in liquids. These devices are employed to facilitate a wide variety of processes, such as mixing, cleaning, degassing, cell disruption, and sample preparation. The use of delicate instruments in the laboratory makes ultrasonic a perfect technology for cleaning and reprocessing. The gentle yet effective cleaning action ensures that contaminants are removed but instruments are not damaged.

Vacuum Pump

Labs routinely use laboratory vacuum pumps in order to do the following: Provide suction that drives the filtration or aspiration of suspended or liquid samples. Control or induce solvent evaporation through the reduction of vapor pressure, like in concentrators, rotary evaporators etc. It is most often used during vacuum filtration of the solutions.

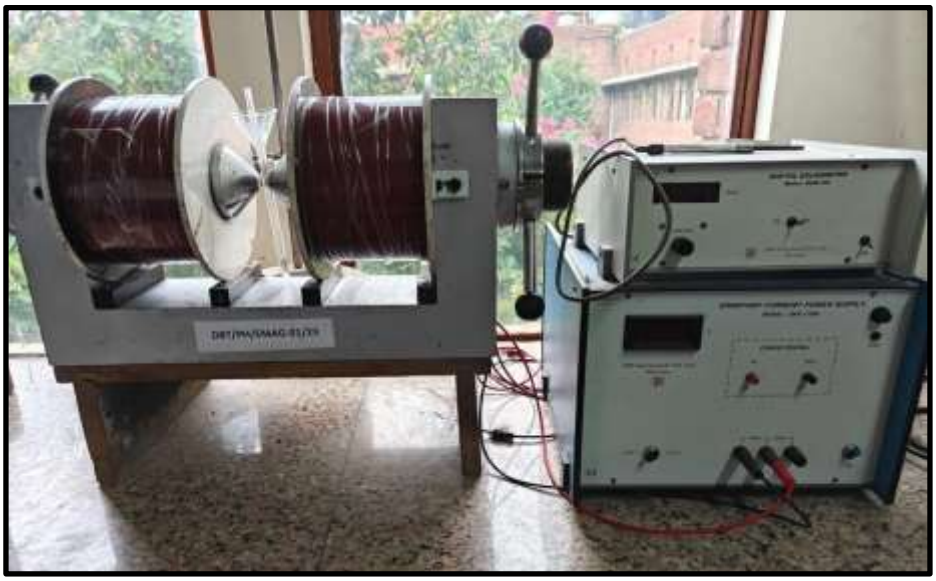


Digital Storage Oscilloscope

Digital storage oscilloscope having two channel input and is capable of digital memory that is going to store the digital copy of the waveform. The storage can last years as well as can be transferred to pen drive or other storage mediums. This will enable the students to integrate the results of an experiment from one semester to enable further processing and analysis in subsequent semesters.

Function Generator

The function generator is a dual channel device which has two input modules. The two modules may be used independently one at a time as well as simultaneously. The students will be benefiting from the independent yet simultaneous use of the two input channels as the two channels provide a coherent as well as phase lag defined sources. This will be immensely helpful in performing experiments like study of Lissajous figures.



Electromagnet with measuring unit

By incorporating electromagnets into undergraduate courses, students gain hands-on experience and a deeper understanding of fundamental principles and their practical applications. Electromagnet can be used to:

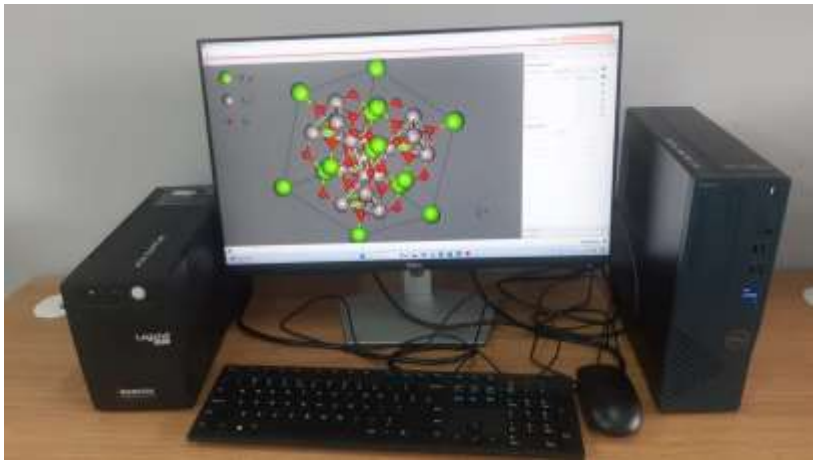
- Controlled magnetic field: Allows for precise control over the magnetic field strength and direction.
- Variable field strength: Enables students to study the effect of changing magnetic field strengths on the Hall voltage.
- Easy setup and adjustment: Electromagnets are relatively simple to set up and adjust, making it easier for students to focus on the experiment.

This electromagnet is also exploited to measure the susceptibility of paramagnetic material salt solution.

- This setup also enables to design Magneto-resistance setup in future.

Surface Plasmon Resonance Set Up

Surface Plasmon Resonance (SPR) setup is used to determine the plasma frequency and hence the refractive index of different materials. It also helps to measure the real and complex part of dielectric constant of materials. SPR is a powerful technique for analyzing the interaction of light with metal surfaces, providing critical insights into the optical properties of metals and other materials. By analyzing the resonance conditions, one can obtain precise values for the dielectric constants, which are essential for various applications in nanotechnology, sensor development, and material science. This setup is fundamental for understanding and utilizing the unique properties of surface plasmons in advanced technological applications.



Workstation with monitor and UPS

Workstation with 13th - generation i-7 processor with clock frequency 2.1 GHz, memory of 32 GB RAM and 1TB hard disk is used for implementing advanced computational algorithms, including simulations based on the techniques of Density Functional Theory, Molecular Dynamics and Machine Learning.

Arduino Kit with accessories

Arduino kits with different sensors compatible with ATMEGA-328 microcontroller can be used for acquisition of real-time data. Different sensors can be interfaced with Arduino Uno board to measure a physical parameter like temperature, humidity, pressure etc.

Welding Machine

Metal waste of college will be welded for making useful products. The welding machine will also be used by students for repairing damaged metal items of the college.

Switch Board Cutting Machine

This machine will be used to cut out desired patterns from wooden and plastic sheets and boxes. E-waste parts will be fitted into these cutout patterns to make usable products thereby upcycling the E Waste.

Transformer Trainer

Students will perform the following extension experiments on this trainer.

a. Star and Delta configuration of three phase transformer and voltage / current relations for balanced and unbalanced loads connected in Star and Delta configuration.
b. To study the variation of power factor for mixed and variable loads.

Electrical Machine Trainer

This set of machines will be used by students to perform following extension experiments.

a. Three phase AC generator
b. Three phase AC motor
c. Series DC Motor and Generator
d. Shunt DC Motor and Generator
e. Compound DC Motor and Generator
f. Configure three phase Connection study Motor as 2 poles, 4 pole, 6 pole configurations and check the rpm.
g. Configure connection study motor as single-phase motor.

Working zig with magnifier and LED light

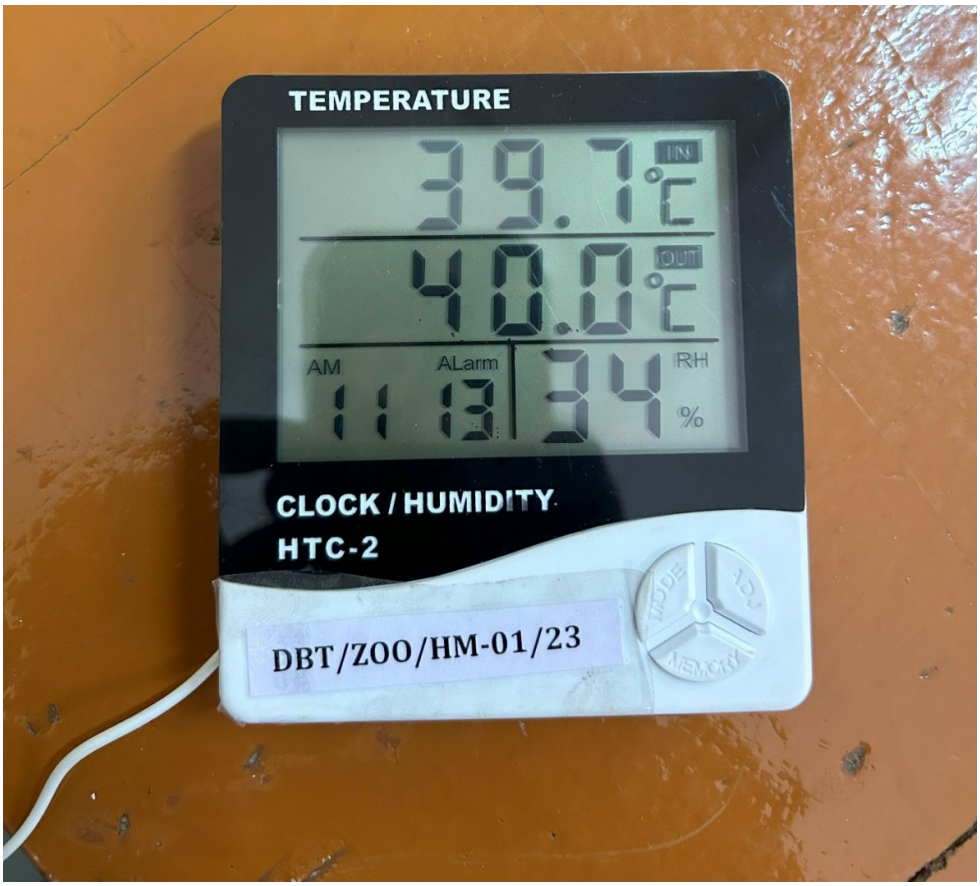
These zigs will be utilized by students for soldering control and fine desoldering.

Multipurpose cutting Machine

It will be used for cutting plastic and wooden sheets out of furniture waste of college and making usable products out of it.

SPIROMETER

A spirometer measures the amount of air a person can inhale and exhale. It can also measure the speed of a person's breath. The spirometer works by using an air tube that's placed in the patient's nose or mouth. When the patient breathes in, the air flows to a sensor at the end of the tube, which sends data to a computer for processing. The spirometer can also use other mechanisms to measure air flow, such as a pneumotachometer, which uses flow rate to measure volume. In this type of spirometer, air is breathed through a resistive element that creates a pressure difference across channels. A pressure sensor then converts this difference into an electronic signal that can be displayed.



HYGROMETER

A hygrometer is a device that measures the amount of water vapor in the air, or humidity. It works by using the principle of evaporative cooling, which is the cooling effect that occurs when water evaporates from a surface. The wet bulb thermometer in a hygrometer measures how much the air cools down due to evaporation, which helps to determine the humidity level. The temperature difference between the wet and dry bulb thermometers is then measured.

VORTEX MIXER

A vortex mixer uses centrifugal force to mix samples by creating a vortex, or spiral flow, in the liquid: A vortex mixer has an electric motor with a vertically attached drive shaft that's connected to a rubber cup that's mounted slightly off-center. When the motor is running, the rubber cup oscillates rapidly in a circular motion. A sample container, such as a test tube, is pressed into the rubber cup or touched to its edge. The motion of the rubber cup is transmitted to the liquid inside the container, creating a vortex. The vortex mixes the contents of the sample by inducing rotational movement throughout it.

TURBIDITY METER

A turbidity meter measures the amount of light scattered by particles in a sample. The principle of turbidimetry involves passing a beam of light through a sample in a cuvette and measuring the intensity of the transmitted light. As particles scatter light away from the incident light path, the intensity of the transmitted light decreases.

LEAF AREA METER

A leaf area meter works by optically scanning a leaf placed on a transparent surface. Light-emitting diodes (LEDs) beneath the surface illuminate the leaf, and a mobile sensor captures an image. Leaf area meters are portable, easy to use, and can be used in the field or outdoors without damaging the leaves. They can also measure related parameters, such as areas of leaf disease.

WEATHER METER

Weather meters, also known as weather stations, use a variety of sensors to measure atmospheric conditions like temperature, humidity, wind speed, and precipitation.

HOT PLATE

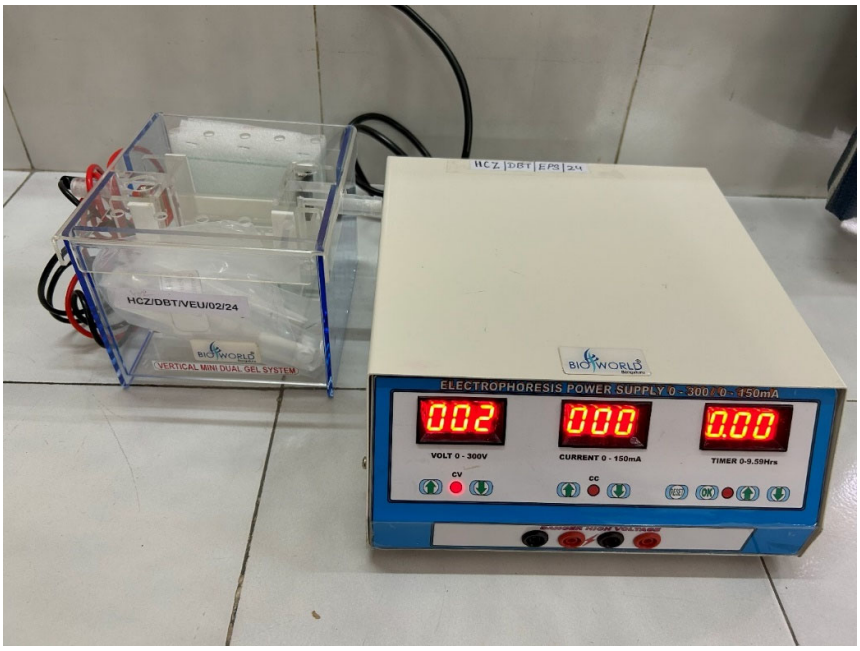
Hot plates, which can be electric or gas, work by using an electric current or heat from burners to heat an electric alloy wire or coil: Electric hot plates: When plugged in, the plug powers a motor that spins a generator to create electricity, which heats the coils. The current flowing through the wire heats it up and conducts heat through the outer shell. Gas hot plates: Use heat from burners to heat the cooking surface.

MICROSCOPE

A compound microscope uses a combination of lenses to magnify a sample, typically up to 1000 times its original size. The working principle of a compound microscope is as follows: Light source :Light from a source such as a halogen, mercury, or LED lamp illuminates the specimen. Condenser: Light rays reflected by a plano-concave mirror enter the condenser, where the lens focuses a cone of light onto the specimen through the stage hole. Objective lens: The objective lens, which is close to the specimen, collects light emitted by the specimen and magnifies it to create the main image within the body tube. Ocular lens : Also known as the eyepiece, the ocular lens magnifies the image created by the objective lens. The final image is virtual, inverted, and magnified behind the object.

SPHYGMOMANOMETER

A sphygmomanometer, also known as a blood pressure monitor, works by measuring the pressure in an artery using an inflatable cuff and a pressure gauge: Wrap the cuff around a limb, usually the brachial artery in the upper arm. Inflate the cuff until the pressure in the bladder is greater than the typical systolic pressure. Slowly deflate the cuff. As the cuff deflates, pulsations will appear when the systolic pressure value is approached. When the first pounding sound is heard, the systolic blood pressure can be read from the pressure meter. When the pounding stops, the diastolic blood pressure can be read from the pressure meter.



PAGE POWERPACK

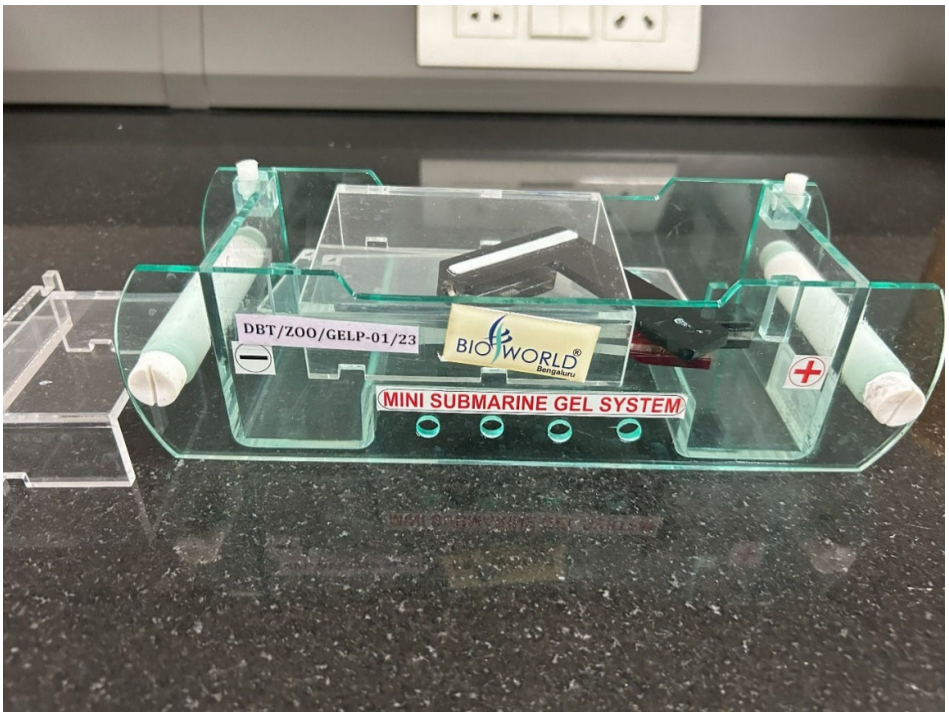
A hydraulic power pack, also known as a hydraulic power unit, is a combination of equipment that uses hydraulic fluid dynamics to generate high pressure. The pack's components include: Power source :An electrical source, such as a generator, external motor, or mains, charges the pack. Motor: Draws energy into the pack and distributes it to the hydraulic system through a control valve. Hydraulic pump:Converts mechanical energy into hydraulic energy, creating a flow of fluid that generates pressure to drive hydraulic motors and actuators.

HAEMOMETER

Hemoglobinometer measures the hemoglobin content of blood by comparing the color of light that passes through a hemolyzed blood sample to a standard color. The results are expressed in grams of hemoglobin per 100 milliliters of blood.

HAEMOCYTOMETER

A hemocytometer is a microscope slide with a counting chamber that allows for precise cell counting within a specific volume. The principle of operation is as follows: Chamber : The hemocytometer has a thick glass slide with a rectangular indentation that creates a chamber. The chamber is carefully crafted so that the area bounded by the lines is known, and the depth of the chamber is also known. Grid: The chamber's slide has a grid etched onto it that segments the volume into smaller, countable areas. The most commonly used grid is the Improved Neubauer chamber, which has an H-shaped indent at the center of the slide that separates the space into two counting chambers.



GEL ELECTROPHORESIS APPARATUS

Gel electrophoresis is a technique used to separate DNA fragments according to their size. DNA samples are loaded into wells (indentations) at one end of a gel, and an electric current is applied to pull them through the gel. DNA fragments are negatively charged, so they move towards the positive electrode. Gel electrophoresis separates molecules by pushing them through a gel with an electrical field. The gel has small pores, similar to a sieve, that allow molecules to pass through when an electric current is applied. One end of the gel has a positive charge and the other has a negative charge, which causes charged molecules to move through the gel. This movement is called migration.

DO METER

Dissolved oxygen (DO) meters work by measuring the amount of oxygen present in a liquid or gas. In these sensors, oxygen diffuses from a sample through an oxygen-permeable membrane and into the sensor, where it undergoes a chemical reduction reaction that produces an electrical signal. The sensor's cathode reduces the oxygen molecules that pass through the membrane, creating a small voltage. When there's no oxygen, the DO meter reads 0 millivolts (mV). As the number of oxygen molecules increases, the DO reading also increases. The voltage can be read using a multimeter or analog-to-digital converter.