

دليل الأجهزة المتقدمة في كلية العلوم

Advanced Equipment Guide in
College of Science



2026 - 1447



1. Ultra-High Resolution Field Emission Scanning Electron Microscope (FE-SEM) (JOEL, JSM-IT 800is)

Objectives:

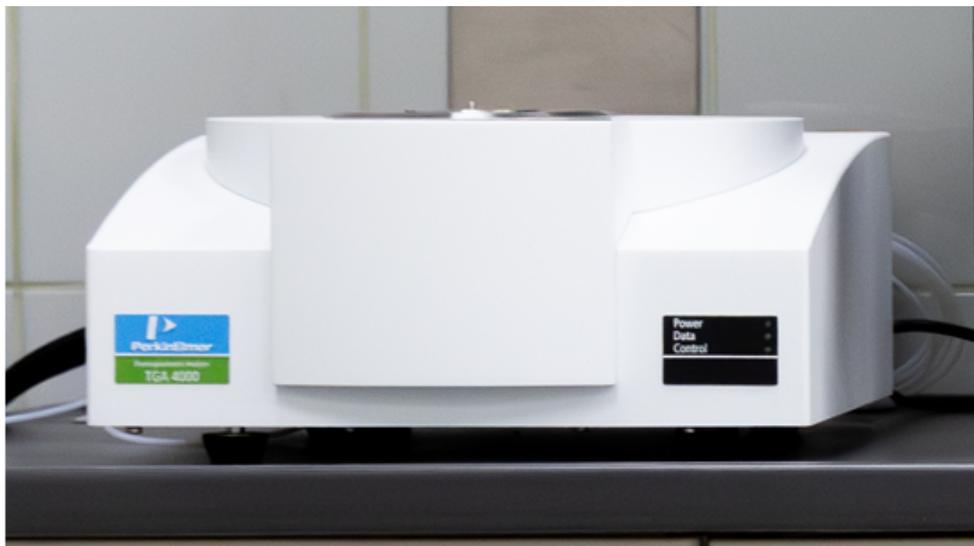
- Obtain ultra-high-resolution images (up to 0.4 nm at 30 kV) of material surfaces, interfaces, and nanostructures.
- Characterize surface morphology, grain size, and texture of a wide range of conductive and non-conductive materials.
- Perform compositional and elemental analysis using the integrated EDS/EDX detector and Electron Backscatter Diffraction (EBSD) system.
- Study nanoscale features in semiconductors, thin films, nanoparticles, and biological or polymeric samples.
- Correlate structure-property relationships by combining topographical and analytical imaging modes.
- Support advanced materials research in fields such as nanotechnology, energy materials (e.g., solar cells), catalysis, and biomaterials.



2. Thermogravimetric Analysis (TGA) System (Perkin Elmer TGA 4000)

Objectives:

- Determine the thermal stability and decomposition temperatures of materials under controlled heating.
- Quantify mass changes associated with physical or chemical transformations such as moisture loss, oxidation, or thermal degradation.
- Identify composition and purity of polymers, composites, ceramics, catalysts, and nanomaterials.
- Characterize kinetic parameters of thermal reactions (activation energy, reaction order, degradation rate).
- Evaluate filler or residue content in hybrid materials and composites.
- Assess performance and stability of advanced functional materials (e.g., bio-polyurethanes, solar-cell encapsulants, coatings).



3. Fluorescence Spectroscopy (Horiba DeltaFlex TCSPC)

Objectives:

- Determine the fluorescence decay times of materials and molecules with picosecond-to-nanosecond temporal resolution using the Time-Correlated Single Photon Counting (TCSPC) technique.
- Investigate radiative and non-radiative recombination processes, quantum yields, and energy transfer mechanisms in organic, inorganic, and hybrid materials.
- Analyze carrier relaxation, charge transfer, and exciton recombination dynamics in semiconductors, nanomaterials, and biological fluorophores.
- Evaluate the efficiency of light-emitting and light-harvesting materials, such as perovskites, quantum dots, and polymers, by studying their lifetime and emission characteristics.
- Acquire both steady-state emission spectra and time-resolved fluorescence decay profiles to obtain a comprehensive understanding of material behavior.



4. Spectroscopic Ellipsometry (Horiba Smart-SE)

Objectives:

- Measure the precise thickness of thin films, single layers, and multilayer structures with sub-nanometer accuracy.
- Extract the refractive index (n) and extinction coefficient (k) of thin films and bulk materials across a wide spectral range.
- Assess uniformity, homogeneity, and surface roughness by analyzing variations in optical parameters.
- Identify compositional or structural variations in semiconductors, dielectrics, polymers, and nanostructured materials through their optical response.
- Quantify optical bandgaps, layer thicknesses, and interface properties in solar cells, LEDs, and other optoelectronic devices.
- Investigate anisotropic thin films, organic coatings, and absorbing layers with wavelength-dependent modeling.



5. Hall Effect System (MMR technologies Inc) Model 3470

Objectives:

- Identify whether the dominant charge carriers in a semiconductor are electrons (n-type) or holes (p-type) through the sign of the Hall voltage.
- Quantify the carrier density in semiconductor, thin-film, or bulk materials by measuring the Hall coefficient under controlled magnetic fields.
- Calculate the mobility of charge carriers from measured conductivity and carrier concentration, reflecting the ease of charge transport in materials.
- Measure electrical resistivity and conductivity as functions of temperature, doping, and material composition to evaluate device performance.
- Analyze how carrier concentration and mobility vary with temperature using the integrated temperature control system (typically from 77 K to 500 K).



6. Keithley Semiconductor Characterization System (Keithley 4200-SCS)

Objectives:

- Perform precise I-V (current-voltage) and C-V (capacitance-voltage) measurements for a wide range of semiconductor devices, including diodes, MOSFETs, BJTs, LEDs, and solar cells.
- Extract fundamental parameters such as threshold voltage, mobility, subthreshold slope, leakage current, series resistance, and breakdown voltage for both bulk and thin-film materials.
- Investigate pn-junction and Schottky diode characteristics to evaluate doping levels, depletion width, and charge transport mechanisms.
- Evaluate MOSFET and JFET performance metrics including transconductance, drain current saturation, gate leakage, and switching behavior for both low-power and high-power applications.
- Measure capacitance-voltage hysteresis, interface trap density, and dielectric breakdown strength in gate oxides, thin films, and multilayer structures.
- Characterize photovoltaic devices by analyzing dark and illuminated I-V curves, series resistance, shunt resistance, fill factor, and conversion efficiency.



7. J/V Characterization System (Photo Emission, CT100AAA, USA)

Objectives:

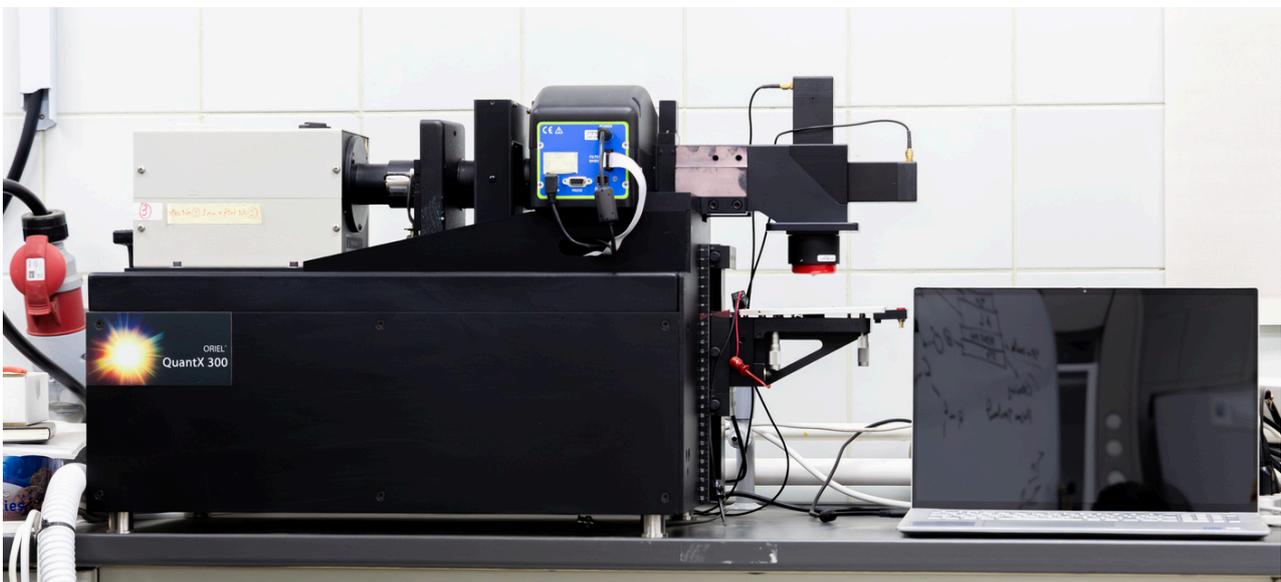
- Accurately determine the current density-voltage (J-V) relationship of photovoltaic and optoelectronic devices under both dark and illuminated conditions.
- Extract essential photovoltaic parameters including short-circuit current density (J_{sc}), open-circuit voltage (V_{oc}), fill factor (FF), and power conversion efficiency (PCE) under standard test conditions (AM1.5G, 1000 W/m^2 , $25 \text{ }^\circ\text{C}$).
- Determine R_s and R_{sh} to evaluate internal losses, contact quality, and leakage pathways that influence device efficiency and stability.
- Extract diode ideality factor, reverse saturation current, and recombination parameters to study the charge transport and recombination dynamics within the device.
- Investigate device performance under varying light intensities to assess photogenerated current behavior, recombination losses, and carrier collection efficiency.



8. Spectral Response System for Solar Cells (QuantX-300, Newport, USA)

Objectives:

- The QUANTX-300 empowers researchers to measure Internal Quantum Efficiency (IQE) and quantify External Quantum Efficiency (EQE), also known as Incident Photon to Charge Carrier Efficiency (IPCE), for any photovoltaic device.
- The product is a turn-key solution which includes all necessary components with integrated light source, monochromator, detectors, electronics, software, and even the computer.
- The QUANTX-300 incorporates a patented detector geometry using a beam splitter, allowing for simultaneous measurement of EQE and the reflective losses to quantify IQE.
- This model also includes a 4-wire sense which broadens the capabilities to include a large range of sample sizes and efficiencies.



9. Low Temperature Cryogenic System (Jenis VPF-100)

Objectives:

- Achieve and maintain low temperatures (typically from 300 K down to 4.2 K or lower) for physical, electrical, and optical property measurements of materials.
- Study temperature-dependent phenomena such as superconductivity, carrier mobility, magnetic transitions, and photoluminescence behavior.
- Control and monitor temperature accurately during experiments using sensors and feedback controllers.
- Enable in-situ sample manipulation (heating, cooling, magnetic field application, optical excitation) under cryogenic conditions.
- Ensure sample and instrument safety while handling cryogenic liquids (e.g., liquid nitrogen or liquid helium).



10. Gas Chromatography (Model: Shimadzu Nexis, GC-2030)

Objectives:

- The analysis of gas chromatography is utilized to calculate the quantity of a chemical substance such as in ensuring the quality of chemicals used that are used in the chemical industry or to determine the presence of harmful substances in soils or air.
- The use of gas chromatography can be found for the analysis of:
 1. air-borne pollutants
 2. performance-enhancing drugs in athlete's urine samples
 3. oil spills
 4. essential oils in perfume preparation
- The gas chromatography method is extremely accurate when utilized correctly, and it can be used to measure picomoles of a substance within 1 ml of liquid samples or parts-per-billion concentrations of gaseous samples.
- Gas Chromatography is widely used in the field of Forensic Science. Different disciplines, such as the solid drug dosage (pre-consumption form) identification and quantification arson investigation as well as paint chip analysis and toxicology investigations, use GC to determine and quantify different biological specimens and crime scene evidence.



11. UV-Vis-IR Spectrophotometer (Model: Agilent Technologies (G9825A))

Objectives:

- Solid Sample Measurements (UV-Vis & UV-Vis-NIR)
- UV-Vis Liquids Analysis
- Quantifying a Molecule—Concentration Measurements using UV-Vis
- Observing Structural Changes with UV-Vis—Conformational Studies of Proteins
- Color Measurement using UV-Vis
- Monitoring Reaction Kinetics with UV-Vis



12. UV/Visible Spectrophotometer (JENWAY 7305)

Objectives:

- Quantitatively measure the absorbance or transmittance of light by liquid samples in the visible and near-UV range (320–1000 nm).
- Determine the concentration of analytes in solutions using Beer-Lambert's law.
- Monitor chemical reactions, color changes, and optical properties of materials over time.
- Assess optical transparency and color intensity of thin-film coatings, nanomaterials, or solar-cell encapsulants.
- Generate calibration curves for quantitative analysis of unknown samples.
- Evaluate purity, degradation, or stability of compounds, polymers, and nanoparticles under various conditions.



13. UV-Visible Spectrophotometer (SHIMADZU UV-2600i)

Objectives:

- Measure the absorbance, transmittance, and reflectance of liquid or solid samples across the ultraviolet and visible spectrum (185–900 nm) with high accuracy.
- Determine the optical properties of materials—such as absorbance maxima (λ_{max}), bandgap energy, and transparency.
- Quantify analyte concentrations in solutions using Beer-Lambert's law.
- Characterize thin films, nanocomposites, and encapsulant materials for solar and optical applications.
- Assess the optical clarity and UV resistance of polymeric or bio-based materials.
- Conduct spectral scanning, kinetic, and multi-component analysis with high spectral resolution.
- Support advanced optical research through precise, reproducible measurements using the dual-beam optical system.



14. Electrochemical System (Potentiostat/Galvanostat) (METROHM AUTOLAB)

Objectives:

- Perform precise electrochemical measurements for the characterization of materials and electrodes.
- Investigate redox reactions and their kinetics using controlled potential or current.
- Determine electrochemical properties such as:
 1. Charge transfer resistance
 2. Double-layer capacitance
 3. Corrosion rates
 4. Electrochemical stability window
- Study energy storage devices, including batteries, supercapacitors, and fuel cells.
- Analyze electrochemical sensors and biosensors for sensitivity and selectivity.
- Evaluate electrocatalytic activity of nanomaterials, composites, or thin films.
- Perform advanced techniques such as cyclic voltammetry (CV), linear sweep voltammetry (LSV), chronoamperometry, chronopotentiometry, and electrochemical impedance spectroscopy (EIS).



15.HANNA Instrument for Measurement of Water Desalination (HANNA INSTRUMENT)

Objectives:

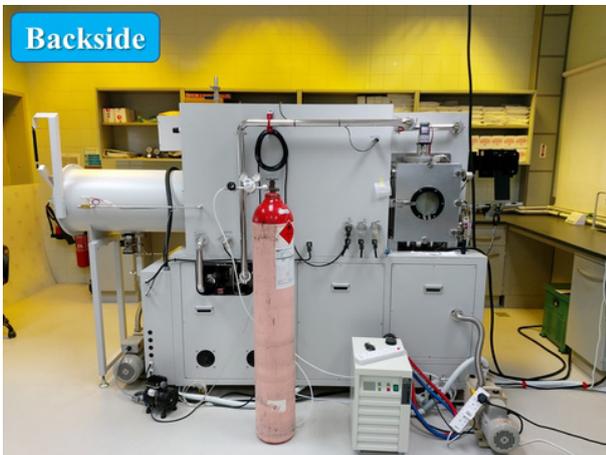
- Determine the efficiency of water desalination systems by measuring water quality parameters.
- Measure electrical conductivity (EC) as an indicator of ion concentration in water.
- Assess Total Dissolved Solids (TDS) to quantify the amount of salts present in water before and after desalination.
- Evaluate salinity levels for drinking water standards or industrial applications.
- Monitor desalination performance over time for processes such as reverse osmosis, electrodialysis, or distillation.
- Ensure water quality compliance with WHO or local standards for potable water.



16. Digitally Controlled Glove Box with Thermal Evaporation System (Solar-Passage, KOREA)

Objectives:

- It is used for preparing thin films and solar cell active layers under N_2 atmosphere inside glove box.
- The glove box is filled with high pure N_2 gas and contains sensors for controlling oxygen and moisture inside the box.
- The machine contains purification unit to purify the N_2 gas inside glove box from moisture.
- After preparation of solar cell active layers using organic solution, it is directly transferred to Thermal Evaporation System contained for preparing metal electrode as a back contact of the solar cells.
- Separately, the Thermal Evaporation System can be used for preparing thin films of organic materials or metals.



17. Transparent Glove Box (China)

Objectives:

- It is used for preparing materials under inert atmosphere for avoiding the interaction with oxygen.
- The glove box is filled with high pure N₂ gas and have connected rotary vacuum pump for evacuation of oxygen from pass box.
- The glove box is transparent for allowing to observe the work inside from every side of the box.
- It is cheaper than metal globe box.
- Several pieces of equipment can be inserted inside glove box such as: spin coater (for preparing solar cell active layers and thin films from solutions), hot plate (for thermal annealing), hot plate magnetic stirrer (for dissolving chemicals to prepare solar cell solutions), and many other tools.



18. Dual Target Magnetron Sputtering (China)

Objectives:

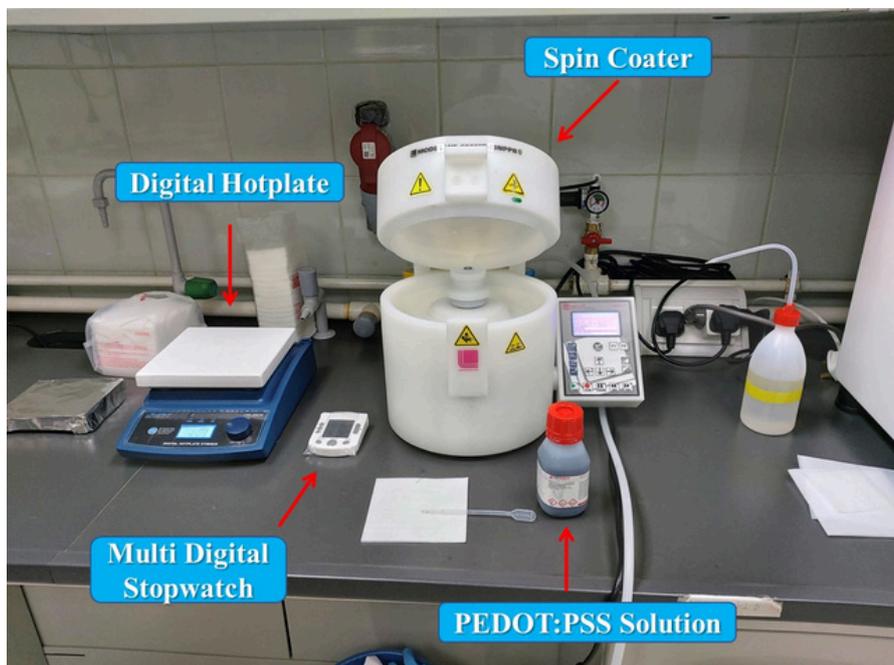
- Deposit thin films of metals, oxides, nitrides, or composite materials with high uniformity and controlled thickness.
- Enable co-sputtering or sequential sputtering using two targets to create alloys or multilayer films.
- Fabricate high-quality coatings for optical, electronic, magnetic, or energy device applications.
- Control film composition, stoichiometry, and microstructure by adjusting target power, substrate bias, and sputtering environment.
- Study the effect of deposition parameters (pressure, gas flow, substrate temperature) on film properties.
- Develop functional materials for applications such as:
 1. Solar cells and encapsulants
 2. Transparent conductive films
 3. Magnetic or dielectric layers
 4. Sensor and catalytic coatings



19. Spin Coater (WS-650MZ-23NPPB, USA)

Objectives:

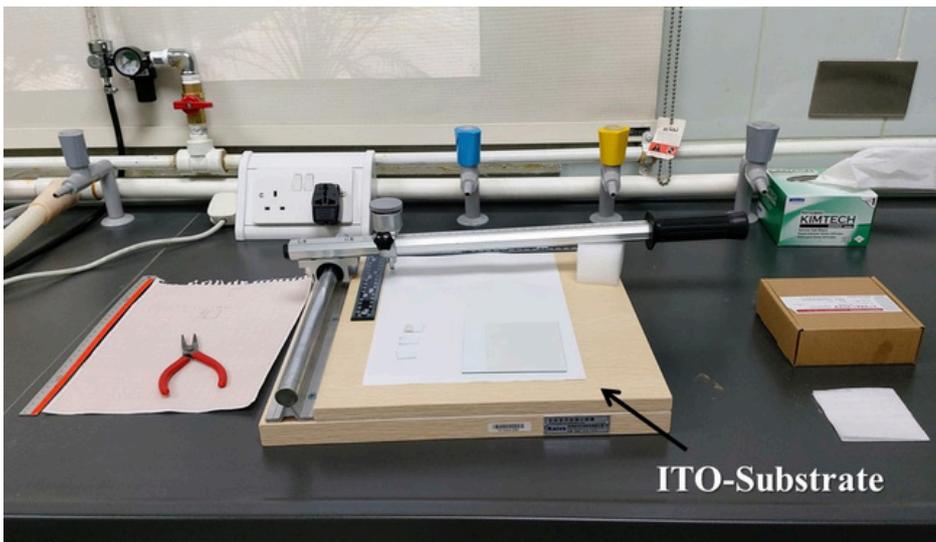
- Produce highly uniform thin films of polymers, photoresists, sol-gel materials, or perovskite precursor solutions on flat substrates (e.g., glass, silicon, or FTO).
- Control film thickness precisely by adjusting spin speed, acceleration, and duration, enabling reproducible coating parameters for device fabrication.
- Achieve smooth, pinhole-free films with controlled morphology, essential for high-quality photovoltaic, dielectric, or semiconductor layers.
- Optimize deposition conditions for various functional materials such as perovskite absorbers, polymer blends, nanocomposites, and sol-gel oxides.
- Deposit successive layers (e.g., ETL/absorber/HTL) in solar cell or optoelectronic structures with excellent interfacial uniformity and adhesion.
- Use high-speed rotation to induce centrifugal spreading and solvent evaporation, leading to rapid film solidification and uniform coverage.



20. ITO-Substrate and Glass Cutter (China)

Objectives:

- Utilize the glass cutter to trim ITO or plain glass substrates into desired dimensions (e.g., $1 \times 1 \text{ cm}^2$, $2 \times 2 \text{ cm}^2$, or $2.5 \times 2.5 \text{ cm}^2$) for consistent device fabrication and testing.
- Ensure smooth, crack-free cuts to prevent micro-fractures that may affect thin-film deposition or electrical contact quality.
- Prepare ITO substrates suitable for spin coating, sputtering, or evaporation, providing an electrically conductive and optically transparent base layer.



21. Oxygen-Plasma Cleaner (Zepto-BRS 200)

Objectives:

- Remove organic contaminants, hydrocarbons, and residual solvents from substrates and device surfaces through plasma oxidation, ensuring pristine surfaces for thin-film deposition.
- Improve surface energy and hydrophilicity of materials such as glass, silicon, polymers, and ITO, promoting better film adhesion for spin coating, sputtering, or printing processes.
- Modify chemically inert surfaces (e.g., PDMS, PTFE, or ITO) by introducing oxygen functional groups ($-OH$, $-COOH$) to enable efficient bonding or coating.
- Prepare substrates for perovskite, polymer, and oxide solar cells by ensuring clean, reactive surfaces that improve electrical contact and interface quality.
- Oxidize surface residues and restore stoichiometry of ITO and FTO electrodes, enhancing their optical and electrical performance before device assembly.
- Use plasma cleaning as a pre-lithography or post-lift-off step to remove photoresist residues and ensure defect-free microstructures.



22. Liquid Nitrogen Maker (IMTEK Cryogenic (CN-Lab 20))

Objectives:

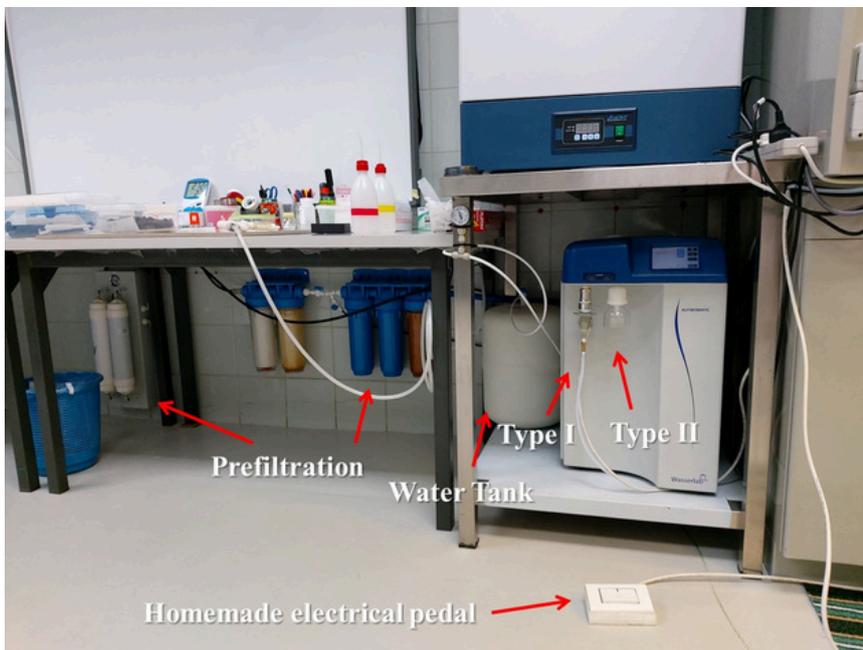
CNP20 is a liquid nitrogen plant with a production capacity of 20 lt/day. The model arrives as a plug-and-liquify system with a built-in air compressor. A fully integrated design and one button operation allows you to place CNP series liquifiers in the research labs, IVF Centers or clean rooms. Simply, make the electrical connections and produce your own liquid nitrogen by a fully automated operation with a user friendly interface of its PLC controller. Operator only needs to replace the filters and perform routine checks between maintenance intervals of 10000 operating hours.



23. Water Purification System (for Type I & II water) (Autwomatic Plus DI-GR)

Objectives:

- It is used for feeding with type I and type II purified water for washing the glassware.
- Type I ultra-pure water is used for cleaning ITO-glass substrates used for solar cell fabrication.



24.4-Digits Analytical Balance (Sartorius MSE524S-100-DU)

Objectives:

- The sensitive balance is used for weighting the solid chemicals in the milligram range with high accuracy.
- It is used for preparing the solutions for preparing solar cell active layers.



25. Desiccator with Vacuum Bump for Chemical Storage (As One, China)

Objectives:

- Transparent acrylic desiccator is used for storing chemical materials and keeping them away from atmosphere and humidity.
- By the way the sensitive chemicals will be protected from interaction with oxygen and will be safe for long time.



26. High-Temperature Furnace (Nabertherm Furnace) (NABERTHERM GMBH)

Objectives:

- Provide controlled, uniform, and repeatable high-temperature heating for materials processing and thermal analysis.
- Perform heat treatments such as calcination, sintering, annealing, and oxidation in air or controlled atmospheres.
- Determine thermal stability, decomposition, and phase transitions in materials including ceramics, composites, polymers, and nanomaterials.
- Improve material crystallinity and phase purity through high-temperature processing.
- Enable precise temperature programming and monitoring using the integrated digital PID controller.
- Support pre- and post-characterization of materials tested by TGA, DSC, or XRD to verify thermal behavior and composition.



27. Muffle Furnace (Lab Tech Muffle Furnace)

Objectives:

- Provide high-temperature heating for material processing, annealing, or decomposition under controlled conditions.
- Determine ash content or perform thermal treatment of samples such as polymers, composites, ceramics, or catalysts.
- Achieve uniform and stable temperatures for sintering, calcination, and oxidation studies.
- Enhance phase formation or crystallization in synthesized materials (e.g., oxides, nanoparticles, or thin films).
- Eliminate organic binders or solvents from samples before further characterization.



28. High-Temperature Furnace (BINDER Furnace)

Objectives:

- Provide precise, uniform high-temperature heating for thermal treatment of materials under controlled conditions.
- Perform annealing, sintering, calcination, or aging of materials for research and industrial applications.
- Evaluate the thermal stability and composition of samples such as polymers, composites, ceramics, catalysts, or metallic powders.
- Achieve accurate temperature control and reproducibility using a programmable PID controller.
- Support pre- or post-thermal analysis in conjunction with TGA, DSC, or XRD studies.
- Ensure safe and reliable operation during long-term, high-temperature processes.



29. Vacuum Drying Oven (Lab Tech LDO-100E)

Objectives:

- It is used for warming up the thin films and different layers of solar cells under vacuum.
- It is used for warming up the glass or ITO-glass substrates, after washing by water, under vacuum for removing the hole contents of water which can be found on the surface of the substrates, for preparing thin films and solar cell layers.



30. Drying Oven (Lab Tech LVO-2030, Korea)

Objectives:

It is used for drying the cleaned glassware which are used for cleaning ITO-glass substrates.



31. Smart Greenhouse Powered by Photovoltaic System

Objectives:

A smart model for cooling a greenhouse with solar energy, which is completely remotely controlled, in order to create a suitable environment for planting some crops in the summer in Al-Madinah Al-Munawwarah.



32. Hybrid Solar Still-Solar Heater

Objectives:

- Solar water desalination model, where a solar water heater was added to this model to speed up the process of evaporation and condensation of salty well water and raise the efficiency of the traditional model of water desalination (Solar Still)
- The product is a hybrid model between a solar heater and a desalination device.



33. Inductively Coupled Plasma Mass Spectrometry (ICP-MS) (Agilent 7850 ICP-MS)

Objectives:

- It is used to detect and quantify trace and ultra-trace elements in a wide variety of samples (e.g., environmental, biological, industrial, and geological).
- It is used to achieve extremely low detection limits (in the parts-per-trillion range) for accurate analysis of elements present in minute concentrations.
- It is used to measure isotopic ratios of elements, useful in geochemistry, nuclear studies, and forensic investigations.
- It is used to simultaneously analyze multiple elements in a single run, saving time and improving efficiency.
- It is used to monitor heavy metal contamination in water, soil, food, and biological samples for environmental safety and public health.



34. Atomic Absorption Spectrophotometer (AAS) (Thermo iCE 3500)

Objectives:

- It is used to determine the concentration of specific metallic elements in liquid samples across various fields, including environmental monitoring, clinical analysis, and food safety.
- It is used to achieve precise and accurate quantification of elements like lead, cadmium, mercury, arsenic, copper, and zinc at parts-per-million (ppm) levels.
- It is used with a graphite furnace for enhanced sensitivity, allowing for the direct analysis of very small sample volumes and the detection of ultra-trace elements.
- It is used with a flame atomizer for rapid and high-precision analysis of elements present at higher concentrations in a sample.
- It is used to perform single-element analysis with high specificity, minimizing interferences from other components in the sample matrix.



35. High Performance Liquid Chromatography (HPLC) (Model: G4286B)

Objectives:

- It is used to separate, identify, and quantify individual components within a complex liquid mixture, such as pharmaceuticals, biological samples, and chemical products.
- It is used to achieve high-resolution separation of compounds based on their interaction with a stationary phase and a mobile phase, ensuring precise analysis.
- It is used to monitor the purity and stability of drug compounds and other chemicals throughout the research, development, and quality control processes.
- It is used to quantify the concentration of active ingredients, impurities, or degradants in a sample with high sensitivity and accuracy.



36. GC-Mass Spectrometer (7820A)

Objectives:

- It is used to separate, identify, and quantify volatile and semi-volatile organic compounds in a complex mixture.
- It is used to provide definitive compound identification by comparing the generated mass spectra to reference libraries in databases such as NIST.
- It is used to detect and measure trace-level contaminants, pollutants, and residues in environmental, food, and forensic samples.
- It is used to analyze and verify the composition of chemical products, pharmaceuticals, and essential oils for quality control and research purposes.



37. High Performance Liquid Chromatography (HPLC) (1220 Infinity LC)

Objectives:

- It is used to separate, identify, and quantify the components of a complex liquid mixture for applications in pharmaceutical, chemical, and environmental analysis.
- It is used to ensure the purity, potency, and stability of drug substances and products by detecting and measuring active ingredients and impurities.
- It is used to achieve reliable and reproducible chromatographic separations with high precision using binary pumps and a thermostatted column compartment.
- It is used to automate the injection of multiple samples from a vial rack, increasing laboratory throughput and operational efficiency.



38. Gas Chromatograph (Model: Agilent 7820A)

Objectives:

- It is used to separate and quantify volatile and semi-volatile organic compounds in a complex mixture for qualitative and quantitative analysis.
- It is used to analyze the composition of samples such as fuels, solvents, essential oils, and environmental extracts with high resolution and efficiency.
- It is used with a Flame Ionization Detector (FID) for the highly sensitive and robust detection of most organic hydrocarbons.
- It is used with precise temperature control of the column oven to optimize the separation of compounds based on their boiling points and polarity.
- It is used to ensure quality control in industrial processes and monitor for specific contaminants or impurities in product formulations.



39. FT-IR-Spectrophotometer (Model: ATR Nicolet iS10)

Objectives:

- Use to measure the vibrational frequency of functional groups.
- Use for vibrational assignments.
- To record IR absorption intensity in term of absorbance or % transmittance.
- To determine the structure of molecules.



40. FT-IR-Spectrophotometer (Model: Thermo Nicolet iS5 TR)

Objectives:

- It is used to identify functional groups in organic and inorganic compounds through detect characteristic absorption bands to determine the presence of specific functional groups (e.g., -OH, -C=O, -NH₂).
- It is used to monitor chemical reactions and processes by tracking the appearance or disappearance of specific functional groups in a sample.
- It is used to ensure quality control by verifying the chemical identity and consistency of raw materials and finished products.
- It is used to detect contaminants or impurities in a sample by identifying foreign functional groups not present in the reference spectrum.



41. Flame Photometer (Jenway PFP7)

Objectives:

- It is used for the routine determination of sodium (Na), potassium (K), calcium (Ca), barium (Ba), and lithium (Li) concentrations in liquid samples.
- It is designed as a single-channel instrument with a low-temperature flame, making it a robust and straightforward solution for elemental analysis.
- It is equipped with a flame failure safety system, making it ideal and safe for use in both industrial and educational laboratory environments.
- It utilizes fine and coarse sensitivity controls to optimize the measurement for each element, ensuring accurate and repeatable results every time.
- It is used to provide reliable, quantitative analysis of specific alkali and alkaline earth metals in applications such as clinical testing, water analysis, and soil studies.



42. UV-VIS Spectrophotometer (Model: EVO300 PC)

Objectives:

- It is used for the quantitative analysis of organic compounds, such as pharmaceuticals and dyes, that absorb light in the ultraviolet and visible region.
- It is used to determine the concentration of biomolecules including nucleic acids (DNA/RNA) and proteins in biochemical and life science applications.
- It is used to ensure quality control in industrial and pharmaceutical settings by verifying sample purity, concentration, and consistency.
- It is used to perform wavelength scans to obtain a sample's absorption spectrum, which aids in compound identification and method development.



43. UV-Vis Spectrophotometer (Model: Jenway 6850)

Objectives:

- It is used for the quantitative analysis of a wide range of samples by measuring their absorption of light in the ultraviolet and visible regions of the spectrum.
- It is used to perform single and multi-wavelength measurements, as well as full spectrum scanning from 190 to 1100 nm, for comprehensive sample characterization.
- It is equipped with a large color touchscreen interface to simplify instrument operation, method setup, and data visualization directly on the device.
- It is used to ensure accurate and reproducible results through a suite of automated validation features, including photometric accuracy and wavelength calibration checks.
- It is used in various applications, including life science research, educational laboratories, and quality control, for tasks such as concentration determination and purity assessment.



44. UV-Vis Spectrophotometer (Model: DR 6000)

Objectives:

- It is used to deliver high-performance analysis for both routine laboratory tasks and demanding photometric applications in professional laboratory settings.
- It is used to perform high-speed wavelength scanning across the UV and Visible spectrum for comprehensive sample characterization and method development.
- It is equipped with over 250 pre-programmed methods to facilitate rapid and accurate testing for the most common water quality parameters.
- It is used with intelligent software that supports instrument calibration, quality assurance protocols, and the development of customized applications.



45. IKA Temperature Control (IKA C6000)

Objectives:

- It is used to provide precise heating and cooling for chemical reactions, distillations, and other laboratory processes requiring accurate temperature management.
- It is used to circulate a temperature-controlled fluid through external equipment such as reactors, condensers, and jacketed vessels to maintain a stable thermal environment.
- It is used to improve the safety and reproducibility of experiments by eliminating the risks associated with traditional heating baths and open flames.
- It is used with an integrated temperature control system to enable rapid heating and cooling cycles, thereby increasing efficiency and reducing process times.
- It is used to support a wide range of applications, from routine laboratory procedures to complex synthetic chemistry, by offering a broad operating temperature range.



46. Melting point Measurement (SMP10)

Objectives:

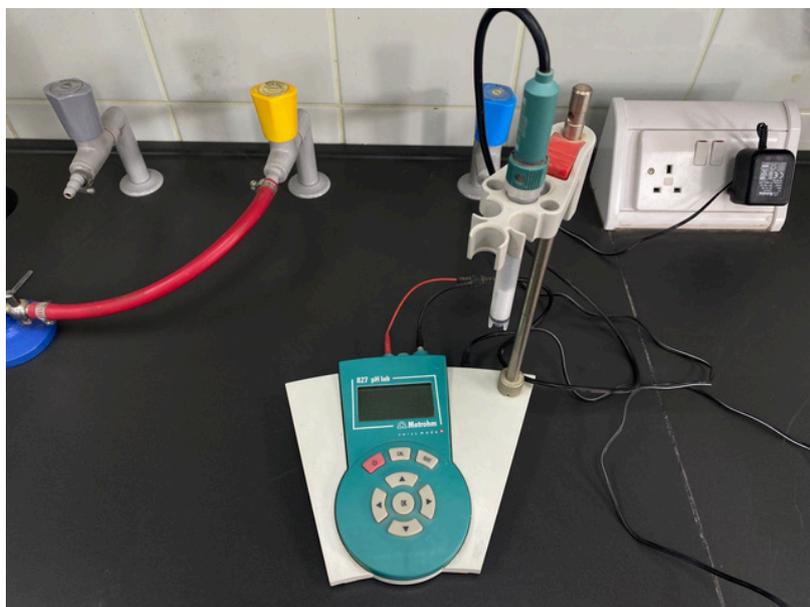
- It is used to determine the melting point and melting range of solid crystalline substances with a high degree of accuracy and reproducibility.
- It is used to identify unknown compounds and assess the purity of a sample by comparing its observed melting point to known literature values.
- It is equipped with a digital display and precise temperature control to allow for clear observation and recording of the melting process.



47. PH Meter (Metrohm 827)

Objectives:

- It is used to measure the pH value of aqueous solutions with high accuracy and precision for quality control, research, and environmental monitoring.
- It is used to determine the acidity or alkalinity of samples in various applications, including water treatment, food and beverage production, and pharmaceutical manufacturing.
- It is equipped with advanced electrode diagnostics and automatic buffer recognition to ensure measurement reliability and simplify calibration procedures.



48. Magnetic susceptibility balance (MSB MK1)

Objectives:

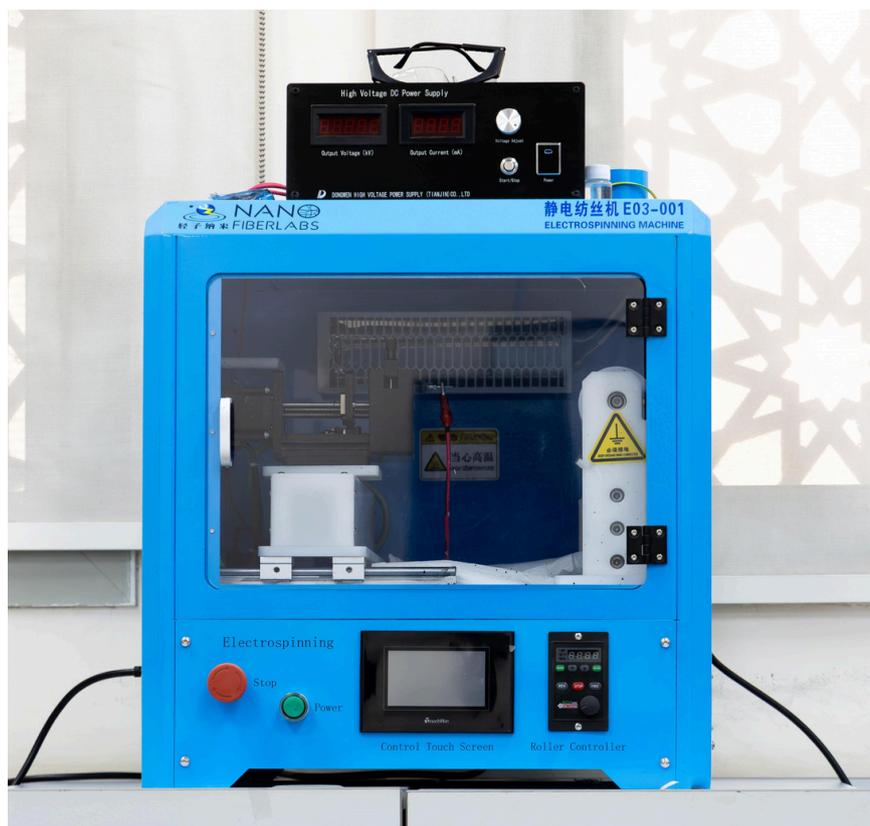
- It is used to measure the magnetic susceptibility of solid and liquid samples, providing key data for identifying and characterizing paramagnetic and diamagnetic compounds.
- It is used to determine the purity of a substance by detecting the presence of paramagnetic impurities, which cause deviations from expected magnetic properties.
- It is applied in inorganic and coordination chemistry to obtain information about the electronic structure and oxidation state of metal ions in a compound.
- It is used as a non-destructive, rapid technique for qualitative analysis, aiding in the identification of unknown minerals and chemical compounds.



49. A Laboratory-Sized Professional Electrospinning Machine (E03-001)

Objective:

- It is used to produce nanoscale to microscale fibers from polymer solutions for research and development purposes.
- It is used to facilitate the study of how various parameters (solution properties, operating voltage, flow rate, environmental conditions) affect final fiber morphology and diameter.
- It is used to create nanofiber mats and scaffolds for applications in water treatment, tissue engineering, drug delivery systems, and wound dressings.
- It is used to develop advanced filtration materials for air and water by producing fibers that can efficiently trap particles, bacteria, and viruses.
- It is used to fabricate materials for energy storage devices (e.g., battery separators, electrodes) and sensor technologies by leveraging the high surface area of nanofibers.



50. Anton Paar Ball Mill (BM500)

Objectives:

- It is used to grind, homogenize, and mix a wide range of samples, including hard, brittle, soft, and fibrous materials, down to the nano range.
- It is used to prepare samples for spectral analysis (e.g., X-ray diffraction, IR spectroscopy) by creating a fine, homogeneous powder.
- It is used for cell disruption and DNA/RNA extraction in biological applications through efficient and rapid grinding of tissue samples.



51. Centrifuge (Z 206 A)

Objectives:

- It is used to separate the immiscible liquids
- It is used to purify the component by removing impurities in the supernatant liquid.
- It is used to separate crystalline drugs from the mother liquor.
- It is used to test the emulsion and suspensions for creaming and sedimentation at an accelerated speed.



52.Orbital Shaker (SHO-1D)

Objectives:

- It is used to provide consistent and controlled agitation for mixing, aerating, or suspending samples in flasks, beakers, or petri dishes.
- It is used to facilitate cell culture growth by ensuring uniform nutrient distribution and gas exchange in liquid growth media.
- It is used to enhance the dissolution of solids in solvents or to accelerate chemical reactions by maintaining a constant, gentle mixing motion.



53. POLYMIX (PX-MFC 90D)

Objectives:

- It is used to grind solid materials into fine powders for general sample preparation in research, quality control, and analytical laboratories.
- It is used to prepare dry samples for various types of analysis, including dry analysis, analysis in liquids, content analysis, and pollutant analysis.
- It is used to process a wide range of sample types by offering interchangeable grinding attachments: the hammer grinding attachment for brittle materials (e.g., dried grains, rocks, ceramics) and the blade grinding attachment for stringy, fibrous materials (e.g., wood, straw, plastics).
- It is used to achieve precise and reproducible particle sizes down to 40 micrometers (μm) through the use of interchangeable sieves with mesh sizes ranging from 0.2 mm to 6.0 mm.
- It is used to ensure user safety and equipment protection with features like an automatic motor stop when the grinding chamber is opened, integrated overload protection, and a dust-protected design.



54. Photochemical Reactor (TOPT-II)

Objectives:

- It is used as a new-generation photocatalysis reaction device to conduct research on gas, liquid, and solid-phase photochemical reactions.
- It is used to study photochemical reactions under various light conditions, including simulated visible light, simulated UV light, and other specialized simulated light sources.
- It is used to investigate the efficacy of different photocatalysts, such as TiO₂, loaded within the reaction vessel for driving specific chemical transformations.
- It is designed with a focus on operator safety protection, stable operation, and a simple, convenient structure for reliable and user-friendly performance.
- It is engineered for free component combination and flexible customization, allowing the system to be adapted for a wide range of specific research applications.



55. BUCHI Rotavapor (R-300)

Objectives:

- It is used to gently and efficiently remove solvents from samples through evaporation under reduced pressure to concentrate solutions or isolate compounds.
- It is used to separate mixtures of liquids by distillation, taking advantage of differences in their boiling points for purification purposes.
- It is equipped with programmable controls and digital interfaces to automate processes, ensure reproducible results, and enable remote monitoring.
- It is designed with safety features such as automatic pressure regulation and secure glassware mounting to protect both the operator and the sample during operation.
- It is applied in various fields including chemical synthesis, pharmaceutical development, and food and fragrance analysis for routine solvent removal and compound isolation.



53. Rotary Evaporator (HB10S099)

Objectives:

- It is used to gently and efficiently remove solvents from heat-sensitive samples through evaporation under reduced pressure and controlled temperature.
- It is used to concentrate solutions or isolate compounds from mixtures while minimizing thermal degradation through precise temperature regulation.
- It is equipped with a digital interface for controlling rotation speed, bath temperature, and vacuum levels to ensure reproducible results.
- It is designed with safety features including automatic lift function and secure glassware clamps to protect operators during evaporation processes.
- It is applied in chemical, pharmaceutical, and food laboratories for routine solvent recovery, compound purification, and sample preparation.



57. Lyoquest Freeze Dryer (Lyoquest-55)

Objectives:

- It is used to preserve biological samples, pharmaceuticals, and food products by removing water content through sublimation under vacuum.
- It is used to extend the shelf life of heat-sensitive materials by dehydrating them while maintaining structural integrity and biological activity.
- It is used to process hydrogel materials by creating porous, scaffold-like structures through the removal of their aqueous phase.
- It is equipped with programmable cycles and temperature controls to ensure efficient and reproducible lyophilization processes for various materials including polymers.
- It is applied in research, pharmaceutical development, and tissue engineering to create stable, dry products and porous biomaterials for long-term storage and analysis.



58. Electric Ovens Dry Heat Sterilizers (MOV-112S Sterilizer)

Objectives:

- It is used to sterilize laboratory glassware, and other heat-stable materials using controlled high-temperature dry heat.
- It is used to achieve sterilization by exposing items to temperatures typically ranging from 160°C to 180°C for a specified duration, effectively destroying microorganisms and pyrogens.
- It is equipped with precise digital temperature control and timer functions to ensure consistent and validated sterilization cycles.
- It is applied in microbiology, pharmaceutical preparation where moisture-sensitive items require sterilization.
- It is designed with safety features including over-temperature protection and secure door latching to ensure operator safety during operation.



59. Milli-Q distilled water (TANKPE100)

Objectives:

- It is used to produce high-purity Type 1 water (ASTM standards) for sensitive analytical applications and molecular biology experiments.
- It is used to generate distilled and deionized water with consistent resistivity (e.g., 18.2 M Ω ·cm) to ensure reliable experimental results.
- It is equipped with a built-in storage tank and dispensing system to provide on-demand purified water while maintaining water quality.
- It is applied in laboratories for preparing mobile phases in HPLC, cell culture media, buffers, and other critical reagents.



60. Water Desalination Plant

Objectives:

- It is used to convert saline or brackish water into potable water suitable for drinking, sanitation, and general facility use.
- It is used to supply consistent-quality purified water for laboratory procedures, industrial processes, and equipment maintenance.
- It is equipped with a control panel, pressure tank, and chemical dosing units to ensure stable operation and water quality compliance.
- It is applied in institutional settings to support water needs for research labs, healthcare facilities, and emergency backup systems.



61.Laboratory Incubator (GALAXY 48 R)

Objectives:

- It is used to grow and maintain microbial colonies or cell colonies.



62. Microplate Reader (Epoch 2)

Objectives:

- It is used for determination of nucleic acids and proteins in microplates.



63. Rotary Microtome (MT-R210I)

Objectives:

- Paraffin sectioning is the most common preparation technique in histology. Its application is not limited to observing the morphology and structure of normal cells, but is also the primary method used in pathology and forensic medicine to study, observe, and determine changes in cellular tissue morphology. Paraffin sectioning is also widely used in other scientific research fields. The rotary microtome is a commonly used auxiliary tool for paraffin embedding in pathology.



64. Autoclave (MaXterile 47)

Objectives:

- A machine that uses steam under pressure to kill harmful bacteria, viruses, fungi and germs on objects placed inside the pressure vessel.

