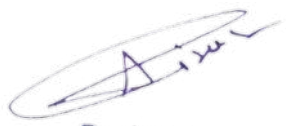

CENTRAL INSTRUMENTATION CENTRE

Criteria: 4.3.3



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ABOUT: THE CENTRAL INSTRUMENTATION CENTRE

The Central Instrumentation Centre at Quantum University not only serves as a hub for traditional scientific disciplines but also embraces emerging technologies with instruments like a 3-D Printer and Robotic Arm with Sliding Rail Kit. These additions reflect the center's commitment to staying at the forefront of technological innovation and meeting the evolving needs of contemporary research. The inclusion of a Nephelo Turbidity Meter, Conductivity Meter, Projection Microscope, Binocular Microscope, and Polarimeter further enhances the center's capabilities, catering to a wide spectrum of research requirements. The Flourimeter and Photoelectric Colorimeter contribute to the facility's versatility, enabling researchers to delve into molecular and chemical analyses with precision.

Moreover, the Central Instrumentation Centre acts as a catalyst for interdisciplinary collaboration by providing researchers access to a diverse range of tools, fostering an environment where ideas and expertise from different fields converge. The presence of a Digital Balance, Mechanical Stirrer, and Desiccators underscores the center's commitment to ensuring precise measurements and controlled experimental conditions. This comprehensive suite of instruments not only supports fundamental research but also finds applications in applied research and development projects.

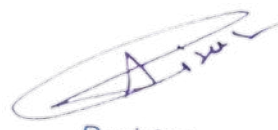
As an integral part of Quantum University, this advanced instrumentation facility not only promotes academic excellence but also serves as a bridge between theoretical knowledge and practical applications. The 3-D Printer and Robotic Arm, in particular, offer students hands-on experience in the realm of emerging technologies, preparing them for the challenges of the modern scientific and technological landscape. In essence, the Central Instrumentation Centre at Quantum University stands as a beacon for innovation, collaboration, and the pursuit of knowledge at the intersection of various scientific disciplines.



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Presenting Image of Centre Instrumentation center




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The Quantum University Instrumentation Centre equip with the following instruments

S. No	Instrument Name	Department
1	Spectrophotometer	Department of Agriculture Studies
2	Flame Photo meter	Department of Agriculture Studies
3	BOD Incubator	Department of Agriculture Studies
4	Digital pH meter	Department of Pharmacy
5	Bulk density	Department of Pharmacy
6	Moisture balance	Department of Pharmacy
7	Homoginizer	Department of Pharmacy
8	Digital balance	Department of Pharmacy
9	Brookfileld viscometer	Department of Pharmacy
10	Mechanical Stirrer	Department of Pharmacy
11	Desiccators	Department of Pharmacy
12	Centrifuge	Department of Pharmacy
13	Polarimeter	Department of Pharmacy
14	Photoelectric colorimeter	Department of Pharmacy
15	Visible Spectrophotometer	Department of Pharmacy
16	Flourimeter	Department of Pharmacy
17	Nephelo Turbidity meter	Department of Pharmacy
18	Conductivity meter	Department of Pharmacy
19	Projection Microscope	Department of Pharmacy
20	Binocular Microscope	Department of Pharmacy
21	Robotic Arm With Sliding Rail Kit	Department of Mechanical Engineering
22	3-D Printer	Department of Mechanical Engineering



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ABOUT: SPECTROPHOTOMETER

A spectrophotometer is a crucial analytical instrument that gauges the amount of light absorption by a sample solution, playing a pivotal role in diverse scientific fields. By measuring the intensity of light before and after it traverses the sample, the spectrophotometer enables the determination of concentrations of known chemical substances. This method relies on the principle that molecules absorb specific wavelengths of light, allowing researchers to deduce the concentration of a substance in the sample based on the extent of light absorption. Widely utilized in biochemistry, environmental science, pharmaceuticals, and physics, spectrophotometers offer both quantitative and qualitative insights. Their versatility makes them indispensable for tasks ranging from identifying substances based on absorption spectra to real-time monitoring of chemical reactions, providing researchers with a powerful tool for unraveling the complexities of matter through the analysis of light interactions



FIG 1. IMAGE OF SPECTROPHOTOMETER



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ABOUT: FLAME PHOTO METER

Flame photometry, a branch of atomic absorption spectroscopy, is alternatively referred to as flame emission spectroscopy, and has evolved into an indispensable tool in the realm of analytical chemistry. This technique plays a pivotal role in determining the concentration of specific metal ions, including sodium, potassium, lithium, calcium, and cesium, among others. The operation of a flame photometer involves utilizing metal ions in the form of atoms, and it is the emitted light from these atoms in a flame that is analyzed. As the atoms return to lower energy states, they release characteristic wavelengths of light. By measuring the intensity of this emitted light, analysts can quantify the concentration of the metal ions in the sample. Flame photometry's precision and sensitivity make it a valuable instrument in various scientific and industrial applications, contributing significantly to the accurate analysis of metal ions in diverse samples.



FIG 2. IMAGE OF FLAME PHOTO METER



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ABOUT: BOD INCUBATOR

BOD (Biochemical Oxygen Demand) incubators, commonly known as low-temperature incubators, play a crucial role in environmental and water quality analysis, specifically for assessing organic matter and nitrogen levels in wastewater samples. These specialized incubators provide controlled conditions, including a stable and low temperature, to facilitate the growth and activity of microorganisms. In the context of BOD testing, microorganisms present in the sample metabolize organic compounds, consuming oxygen in the process.

BOD incubators create an environment conducive to the microbial breakdown of organic substances, allowing for the measurement of the oxygen consumed over a specified incubation period. By quantifying the reduction in dissolved oxygen, analysts can determine the BOD levels in the water sample. This information is vital for evaluating the pollutant load in wastewater and assessing its impact on aquatic ecosystems.

In essence, BOD incubators serve as essential tools for environmental scientists and water quality analysts, providing the controlled conditions necessary to conduct accurate and reliable BOD testing, which is critical for monitoring and managing the impact of wastewater on natural water bodies.



FIG 3. IMAGE OF BOD INCUBATOR

ABOUT: DIGITAL PH METER

An electronic pH meter is an invaluable instrument employed for precise and accurate pH measurements in various scientific, industrial, and research applications. Functioning on the principle of measuring hydrogen ion activity in solutions, pH meters play a crucial role in determining the acidity or alkalinity of a solution. Unlike traditional pH indicators, electronic pH meters offer a higher degree of accuracy and reliability in measuring the hydrogen ion concentration.

These meters typically consist of a glass electrode that responds to changes in hydrogen ion concentration by generating a voltage. A reference electrode is also used to maintain a stable reference potential. The resulting voltage is then converted into a pH value, providing a direct and quantitative measure of the solution's acidity or alkalinity.

The electronic pH meter's versatility makes it indispensable in fields such as chemistry, biology, environmental science, and food and beverage industries. Its ability to provide real-time, quantitative pH measurements makes it an essential tool for researchers, quality control professionals, and scientists who require precise information about the chemical properties of a solution.

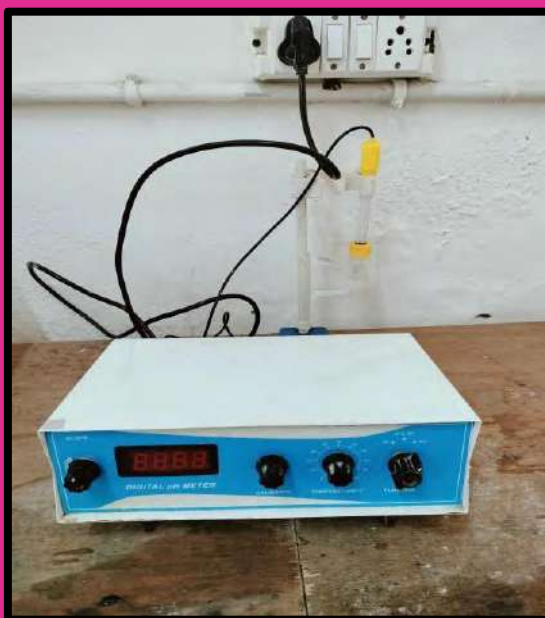


FIG 4. IMAGE OF DIGITAL PH METER

ABOUT: BULK DENSITY

The bulk density apparatus is a specialized testing instrument designed for the accurate measurement of the bulk density property in various divided solids, including powders and granules. This apparatus finds widespread use in diverse industries, particularly in the evaluation of mineral components such as soil, gravel, and sand. Additionally, it is a crucial tool in assessing chemical substances, notably in pharmaceutical applications, as well as in the characterization of plastic materials like polyethylene (HDPE or MDPE), PVC, and polystyrene.

The bulk density of a material is a key parameter that quantifies the mass of a substance per unit volume. In the context of the apparatus, the measurement involves determining the mass of a known volume of the substance. This information is valuable for quality control, research, and manufacturing processes, helping ensure consistency and efficiency in the handling of various materials. The bulk density apparatus serves as an essential tool for industries where accurate knowledge of the bulk density of powders and granules is critical for optimizing processes and meeting quality standards.



FIG 5. IMAGE OF BULK DENSITY



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ABOUT: MOISTURE BALANCE

A moisture balance is a precision instrument that employs the loss on drying method, also known as the thermogravimetric principle, to accurately determine the moisture content of a given sample. This method involves subjecting the sample to controlled heating, during which the moisture content evaporates, and the resulting weight loss is measured.

The moisture balance is particularly well-suited for applications in various industries, including food, pharmaceuticals, and chemicals, where precise knowledge of moisture content is critical for quality control and production processes. In the food industry, for instance, maintaining optimal moisture levels is essential for preserving product quality and shelf life. Similarly, in pharmaceuticals and chemicals, controlling moisture content is crucial to ensuring product stability and performance.

The device offers a rapid and efficient means of moisture analysis, providing reliable and reproducible results. By utilizing the moisture balance, industries can enhance product consistency, adhere to quality standards, and optimize manufacturing processes. Its versatility and accuracy make it an indispensable tool for professionals involved in quality assurance, research, and development across various sectors.



FIG 6. IMAGE OF MOISTURE BALANCE

ABOUT: HOMOGENIZER

A homogenizer is a specialized mixing device designed to achieve a uniform and consistent mixture by breaking down components and distributing them evenly throughout a solution. This essential piece of equipment finds application across various industries, playing a crucial role in processes that require the creation of stable emulsions or the reduction of particle sizes to achieve a homogeneous product.

The invention of the homogenizer is credited to Auguste Gaulin, who initially developed it for the purpose of homogenizing milk. Gaulin's innovation revolutionized the dairy industry by creating a method to prevent cream separation in milk, resulting in a smoother and more consistent product.

In its operation, a homogenizer employs mechanical force to break down particles or droplets to a smaller and more uniform size. This is particularly beneficial in industries such as food and beverage, pharmaceuticals, and cosmetics, where product consistency, stability, and texture are paramount.

Overall, the homogenizer stands as a versatile and indispensable tool in modern industrial processes, ensuring that diverse mixtures, from food products to pharmaceutical formulations, meet the desired standards of quality and uniformity.



FIG 7. IMAGE OF HOMOGENIZER


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ABOUT: DIGITAL BALANCE

Digital balances are precision instruments designed for accurately measuring the mass of an object. Unlike traditional balances with mechanical components, digital balances utilize electronic components and sensors to provide a digital readout of the measured mass. The inner workings and design of digital balances can vary significantly between brands and models, but they generally share common principles.

The essential components of a digital balance include a load cell or strain gauge, which deforms under the applied load, generating an electrical signal proportional to the force exerted on it. This signal is then converted into a digital readout by a microprocessor or digital display. The user interface often includes features such as tare functionality, which allows the user to subtract the mass of a container or previously weighed material.

Digital balances offer advantages such as high precision, ease of use, and the ability to quickly and accurately record measurements. They find extensive application in laboratories, research facilities, and industrial settings where precise mass measurements are critical. Due to the varying designs and features among different brands, users can choose digital balances tailored to their specific requirements and applications.



FIG 8. IMAGE OF DIGITAL BALANCE

ABOUT: BROOKFIELD VISCOMETER

Brookfield viscometers are a category of ICI-type viscometers characterized by cone-plate geometry and controlled speed, enabling swift and precise viscosity measurements on small sample volumes. The ICI (Institute of Chemical Industry) design, integrated with cone-plate geometry, provides an effective means of characterizing viscosity at high shear rates. This type of viscometer is particularly well-suited for applications in industries dealing with products like paints, varnishes, inks, resins, and petroleum-based substances.

The cone-plate configuration ensures accurate and consistent measurements by subjecting the sample to a well-defined shear field, allowing for the assessment of its flow behavior and viscosity. This method proves especially valuable for materials with variable rheological properties, providing insights into their performance and facilitating quality control processes.

By employing Brookfield viscometers, industries can efficiently assess and monitor the viscosity of their products, ensuring that formulations meet the required standards for application, performance, and stability. These viscometers play a vital role in quality assurance and research and development efforts across a spectrum of industries dealing with liquid formulations.



FIG 9. IMAGE OF BROOKFIELD VISCOMETER

ABOUT: MECHANICAL STIRRER

A mechanical stirrer is a laboratory device that serves the purpose of mixing liquids or solutions within a container. It typically comprises an electric motor connected to a metal rod with blades at the end. This metal rod is immersed in the liquid or mixed liquor, and when the motor is activated, it imparts rotational motion to the blades, facilitating thorough mixing of the contents.

The mechanical stirrer's design and function are straightforward yet crucial in various scientific and research applications. It provides a controlled and consistent means of stirring or agitating substances in a laboratory setting. The rotation of the blades helps homogenize solutions, dissolve solutes, and maintain a uniform distribution of particles within the liquid.

This equipment is widely employed in chemistry, biology, and other scientific disciplines where precise and controlled mixing is essential for experiments, reactions, or sample preparations. The versatility of mechanical stirrers makes them valuable tools in laboratories for ensuring reproducibility and accuracy in a wide range of scientific processes.



FIG 10 IMAGE OF: MECHANICAL STIRRER

ABOUT: DESICCATORS

Desiccators are a type of sealable container equipped with desiccants, substances that absorb moisture, and are primarily employed for preserving moisture-sensitive items. One common example of such an item is cobalt chloride paper, which is often stored in desiccators for future use. The primary purpose of a desiccator is to maintain a low-humidity environment within the enclosure to prevent the degradation or alteration of substances that are sensitive to moisture.

In laboratories and various scientific settings, desiccators are frequently used to protect hygroscopic chemicals or materials that can react adversely with water vapor. By creating a dry and controlled atmosphere, desiccators help ensure the stability and integrity of these substances over time. The sealable nature of desiccators prevents external moisture from entering and affecting the stored items.

Desiccators are particularly valuable for experiments and procedures where maintaining precise conditions is critical. They come in various designs, including vacuum desiccators, which enhance moisture removal by lowering the pressure within the enclosure. Overall, desiccators play a vital role in preserving the quality of moisture-sensitive items in laboratory environments.



FIG 11 IMAGE OF: DESSICATOR

ABOUT: CENTRIFUGE

A centrifuge is a crucial laboratory device employed for the separation of fluids, either gas or liquid, based on their density differences. This separation process is achieved by rapidly spinning a container, such as a tube or rotor, at high speeds. The centrifugal force generated during this spinning motion pushes the heavier components of the mixture toward the outer edges of the container, creating a density gradient.

The principle behind a centrifuge relies on the fact that denser materials experience a greater centrifugal force and migrate outward more rapidly than less dense components. As a result, the different components of the mixture are effectively stratified, allowing for the isolation and collection of the desired substance.

Centrifuges are versatile tools with applications in various scientific and medical fields. They are commonly used for tasks such as separating blood components, isolating cellular or molecular materials, and purifying biological samples. The speed and efficiency of centrifugation make it an indispensable technique in laboratories where precise separation of components is essential for accurate analysis and experimentation.



FIG 12 IMAGE OF: CENTRIFUGE

ABOUT: POLARIMETER

Polarimeters are optical instruments designed for the analysis of the polarization properties of light beams and samples. These instruments play a crucial role in elucidating the polarization state of light, providing valuable information about its characteristics. Light-measuring polarimeters specifically focus on determining the polarization state of a beam of light and delivering comprehensive details about its polarization properties.

In a polarimeter, the measurement typically involves assessing the rotation of the plane of polarization caused by the interaction of light with a sample. This is particularly useful in various scientific fields, including chemistry, physics, and material science. Polarimeters find application in determining the concentration of optically active substances in solutions, studying molecular structures, and analyzing the optical properties of materials.

The information obtained from polarimeters is essential for understanding the behavior of light and its interactions with different substances. Researchers and scientists leverage polarimeters to gain insights into the optical characteristics of materials, contributing to advancements in fields ranging from pharmaceuticals to telecommunications. Overall, polarimeters serve as indispensable tools in optical analysis, providing precise measurements of polarization that contribute to a deeper understanding of light-matter interactions.



FIG 13. IMAGE OF POLARIMETER

ABOUT: PHOTOELECTRIC COLORIMETER

A photoelectric colorimeter is a sophisticated instrument designed for precise measurement of the absorbance and transmission characteristics of a sample. One of its notable features is the capability for auto zeroing of absorbance and setting 100% transmission, providing a baseline reference for accurate readings. The incorporation of a microcontroller enhances the instrument's versatility, making it a state-of-the-art tool for a variety of applications.

The auto zeroing feature ensures that the instrument accounts for any background noise or baseline variations, enhancing the accuracy of absorbance measurements. Additionally, the ability to set 100% transmission establishes a reference point for the maximum amount of light that can pass through a sample, aiding in the calibration and normalization of readings. The use of microcontrollers in the design of the colorimeter allows for advanced control and automation, enabling precise and reproducible measurements. The instrument utilizes 10 mm pathlength matched test tubes for both the sample and blank, ensuring consistency and accuracy in the measurement process.

Overall, the photoelectric colorimeter stands out as a sophisticated analytical tool with modern features, making it well-suited for applications in chemistry, biology, environmental science, and other fields where precise measurement of light absorption and transmission is critical.



FIG 14. IMAGE OF PHOTOELECTRIC COLORIMETER

ABOUT: VISIBLE SPECTROPHOTOMETER

A visible spectrophotometer is an advanced instrument that utilizes solid-state technology and microcontroller-based systems for rapid and precise spectrophotometric analysis of concentrations in a given sample. This instrument is designed to operate within a specific wavelength range, typically spanning from 340 nm to 1020 nm, covering the visible spectrum of light.

The microcontroller-based design enhances the spectrophotometer's functionality, providing a high level of automation, accuracy, and ease of use. This technology allows for quick and efficient analysis of the absorption or transmission of light by a sample at different wavelengths, enabling the determination of concentration based on the Beer-Lambert law.

Visible spectrophotometers are widely employed in various scientific disciplines, including chemistry, biochemistry, and environmental science. They find applications in analyzing the concentration of substances in solutions, identifying and quantifying chemical compounds, and assessing the purity of samples. The broad wavelength range of 340 nm to 1020 nm makes this instrument versatile for a wide range of analyses involving visible light-absorbing species.

Overall, the solid-state microcontroller-based design of the visible spectrophotometer reflects its modern and efficient approach to spectrophotometric analysis, making it an essential tool for laboratories and research facilities requiring accurate and rapid concentration measurements.



FIG 15. IMAGE OF VISIBLE SPECTROPHOTOMETER

ABOUT: FLOURIMETER

A fluorometer, also referred to as a fluorimeter or fluorimetry, is a specialized device designed for measuring various parameters related to visible spectrum fluorescence. Fluorescence is the phenomenon where a substance absorbs light at a specific wavelength and re-emits light at a longer wavelength. Fluorometers are particularly useful for analyzing the intensity and wavelength distribution of the emission spectrum after a sample has been excited by a certain spectrum of light.

The basic operation of a fluorometer involves illuminating a sample with a specific wavelength of light (excitation light), causing the sample to emit fluorescence. The instrument then measures the intensity and wavelength characteristics of this emitted light, providing valuable information about the sample's composition and properties. Fluorometers have widespread applications in fields such as biochemistry, molecular biology, environmental science, and materials science. Researchers use them to study the fluorescence of molecules, including fluorophores like fluorescent dyes or proteins, which are commonly employed as molecular markers in biological and chemical analyses.

Overall, fluorometers play a crucial role in understanding the fluorescence behavior of substances, allowing scientists to glean insights into molecular structures, concentrations, and environmental conditions. Their versatility and precision make them essential tools in various scientific and analytical applications.



FIG 16. IMAGE OF FLOURIMETER

ABOUT: NEPHELO TURBIDITY METER

Turbidity monitors operate based on the nephelometric method; a technique used to measure the amount of light scattered at right angles to an incident light beam by particles present in a sample. In the context of turbidity measurement, the level of turbidity in a fluid is determined by analyzing the scattered light produced by suspended particles in the sample.

The nephelometric turbidity units (NTU) serve as a standardized measurement unit for turbidity. The instrument illuminates the sample with a light source, and a detector positioned at a right angle to the incident light beam measures the intensity of the scattered light. The degree of turbidity is directly related to the amount of scattered light detected, and this information is then quantified in NTU.

Turbidity monitors find widespread use in water quality monitoring, environmental assessment, and various industrial processes where the clarity of liquids is crucial. The nephelometric method provides a standardized and precise approach to turbidity measurement, allowing for consistent and comparable results across different samples and applications.



FIG 17. IMAGE OF NEPHELO TURBIDITY METER



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ABOUT: CONDUCTIVITY METER

An electrical conductivity meter, often referred to as an EC meter, is a device designed to measure the electrical conductivity in a solution. Electrical conductivity is a key indicator of the concentration of ions, including salts and other dissolved substances, in a liquid. The meter measures the ability of a solution to conduct an electric current, which is directly related to the concentration of ions present.

EC meters have diverse applications in research and engineering, playing a crucial role in various fields. One common application is in hydroponics, where the meter is used to monitor nutrient levels in the nutrient solution provided to plants. In aquaculture and aquaponics, EC meters help assess the water quality by measuring the concentration of dissolved ions. Additionally, EC meters are widely employed in freshwater systems to monitor the purity of water and detect the presence of impurities.

The versatility of EC meters makes them essential tools for maintaining optimal conditions in environments where precise control of ion concentrations is critical for the health and growth of plants or aquatic organisms. Researchers, farmers, and environmental scientists rely on these meters to ensure that nutrient levels and water quality meet the required standards for various applications.



FIG 18. IMAGE OF CONDUCTIVITY METER

ABOUT: PROJECTION MICROSCOPE

The compound light microscope consists of a halogen lamp as a light source, a condenser lens to focus and concentrate light onto the specimen, objective lenses for magnification, and a projection lens (eyepiece) to further magnify the image. The specimen, typically on a glass slide, is placed on the stage. The light source ensures uniform illumination. This widely-used instrument is essential in laboratories and education, allowing for the observation of small specimens with varying levels of magnification. The combination of lenses produces a clear and magnified image, providing valuable insights into microscopic structures for scientific research and educational purposes.



FIG 19. IMAGE OF PROJECTION MICROSCOPE



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ABOUT: BINOCULAR MICROSCOPE

A binocular microscope is an optical microscope equipped with two eyepieces, designed to enhance viewing comfort and reduce eye strain. The use of dual eyepieces facilitates a more ergonomic and immersive viewing experience. Most modern microscopes available today are binocular, though the specific arrangement and interaction between the two lenses can vary based on the microscope type. Binocular microscopes are widely used in scientific research, education, and various industrial applications, providing users with a stereoscopic view and improved depth perception. The dual eyepieces allow for more natural and prolonged observation of microscopic specimens, making binocular microscopes a standard and indispensable tool in microscopy.



FIG 20. IMAGE OF BINOCULAR MICROSCOPE



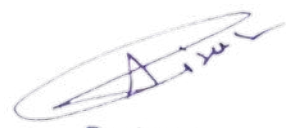
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ABOUT: ROBOTIC ARM WITH SLIDING RAIL KIT

The Robot Arm with Sliding Rail on the DOBOT Magician extends the horizontal workspace by 1 meter, enabling versatile applications such as long-distance picking and placing. This feature facilitates efficient handling of objects over extended ranges and supports tasks like extensive laser engraving, writing, and drawing. The sliding rail enhances the robot arm's adaptability, making it a valuable tool for various industrial and creative tasks. Whether it's precision manipulation over extended distances or intricate laser-based operations, the DOBOT Magician with the sliding rail offers expanded capabilities, making it suitable for a range of applications in manufacturing, automation, and artistic endeavors



FIG 21. IMAGE OF ROBOTIC ARM WITH SLIDING RAIL KIT



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ABOUT: 3-D PRINTER

Three-dimensional (3D) printing is an additive manufacturing process that transforms digital designs into tangible objects. This method involves depositing successive layers of material, such as liquid or powdered plastic, metal, or cement, and subsequently fusing these layers together to construct the final product. The layer-by-layer approach allows for precise and intricate designs, enabling the creation of complex geometries that may be challenging to achieve through traditional manufacturing methods. 3D printing finds applications in various industries, including manufacturing, healthcare, and prototyping, offering a versatile and innovative means of producing customized and intricate objects with efficiency and precision.

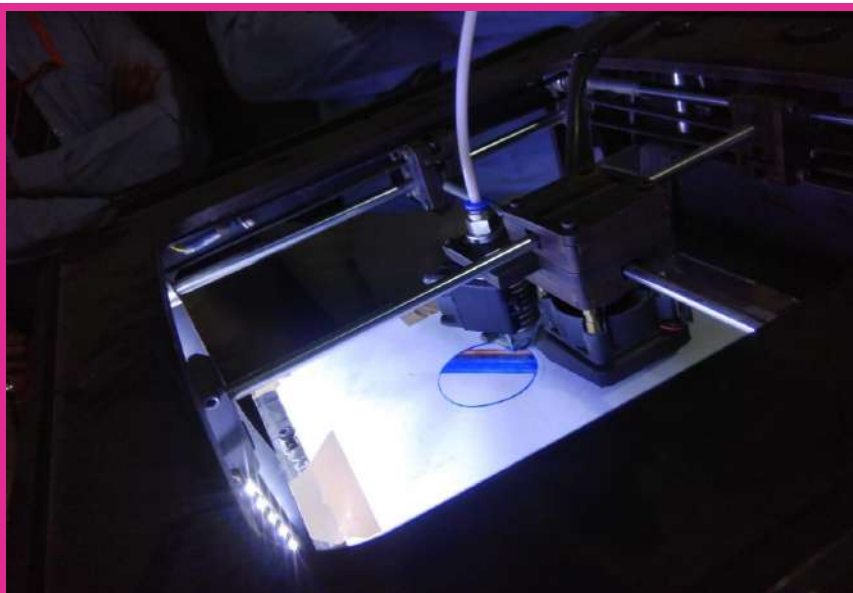


FIG 22. IMAGE OF 3-D PRINTER



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