Basic Instruments/ Equipment used in Clinical Laboratory

- It is used in scientific laboratories to carry out experiments, research, and specific task.
- It plays a vital role in the accuracy and reliability of scientific data, ensuring that experiments can be replicated and verified by other scientists.
- These tools are meant for use by scientists, students, professors, and medical professionals. Some scientific lab equipment is used for weighing materials, mixing and creating solutions, and cleaning comntainers.
- Any experiment must be performed with care to prevent injury. To ensure safety and properly carry out an experiment, It is essential to understand the names and purposes of lab equipment.

Importance of Laboratory Apparatus

- Accurate and reliable data is the foundation of scientific research.
- Laboratory apparatus allows scientists to control and manipulate variables, ensuring precise measurements and observations. Without the right apparatus, experiments would be prone to errors and inconsistencies, making it difficult to draw valid conclusions

Types of Laboratory Apparatus

GLASSWARE

- Is on of the most common types of laboratory apparatus. It includes items such as beakers, flask, test tubes, and pipettes. These items are typically made of borosilicate glass, which can withstand high temperatures and chemical reactions

PLASTICWARE

- Made from various types of plastic, is another category of laboratory apparatus. It is often used when glassware is not suitable, such as in situations involving corrosive substances or when lightweight and disposable materials are required.

METALWARE

- Encompasses laboratory apparatus made from metals or metal alloys. Examples include crucibles, tongs, spatulas, and clamps.
- It is known for its durability and resistance to high temperatures

Heating Equipment

- Such as Bunsen burners and hot plates, is crucial for conducting experiments that require controlled heating.
- These apparatuses enable scientists to heat or boil substances, facilitating various chemical reactions and processes.

Measuring Instruments

- Such as thermometers, balances, and graduated cylinders, are essential for obtaining accurate measurements of volume, mass, temperature, and other physical properties.
- These instruments allow scientists to quantify their observations and analyze data effectively

Common Laboratory Instruments/ Equipments

Glass Slides and Coverslips

- A microscope slide is a thin flat piece of glass used to hold objects for examination under a microscope. Typically the object is mounted (secured) on the slide, and then both are inserted together in the microscope for viewing. This arrangement allows several slide-mounted objects to be quickly inserted and removed from the microscope, labeled, transported, and stored in appropriate slide cases or folders, etc.

- Microscope slides are often used together with a coverslip or cover glass, a smaller and thinner sheet of glass that is placed over the specimen. Slides are held in place on the microscope's stage by slide clips, slide clamps or a cross-table which is used to achieve precisely, remote movement of the slide upon the microscope's stage (such as in an automated / computer-operated system, or where touching the slide with fingers is inappropriate either due to the risk of contamination or lack of precision)

Test Tube

- To be precise, a test tube is nothing but a piece of glass or plastic tubing with one end closed off by its own material. The test tubes we see being used in the laboratories today are generally made of glass, and in pathological laboratories, the test tubes are often made of clear, sterile plastic.
- Test tubes are used to hold some amount of liquid or powdered material, and are kept vertically so that the open side is up top and the closed end is at the bottom. They are stored in the labs in special racks called test tube rack that allow the tubes to stand upright.

Test Tube Rack

- Test tube racks are laboratory equipment used to hold upright multiple test tubes at the same time.
- They are most commonly used when various different solutions are needed to work with simultaneously, for safety reasons, for safe storage of test tubes, and to ease the transport of multiple tubes.
- Test tube racks also ease the organization of test tubes and provide support for the test tubes being worked with.

Tweezers

- Tweezers (or Forceps) are an extention of our fingers and they allow us to grab, grip, place, remove or hold items that are too small or delicate for our fingers to manipulate. The size and shape of the items we grab, grip, place or hold necessitate the need for a variety of tweezer tip styles and shapes.

Vials

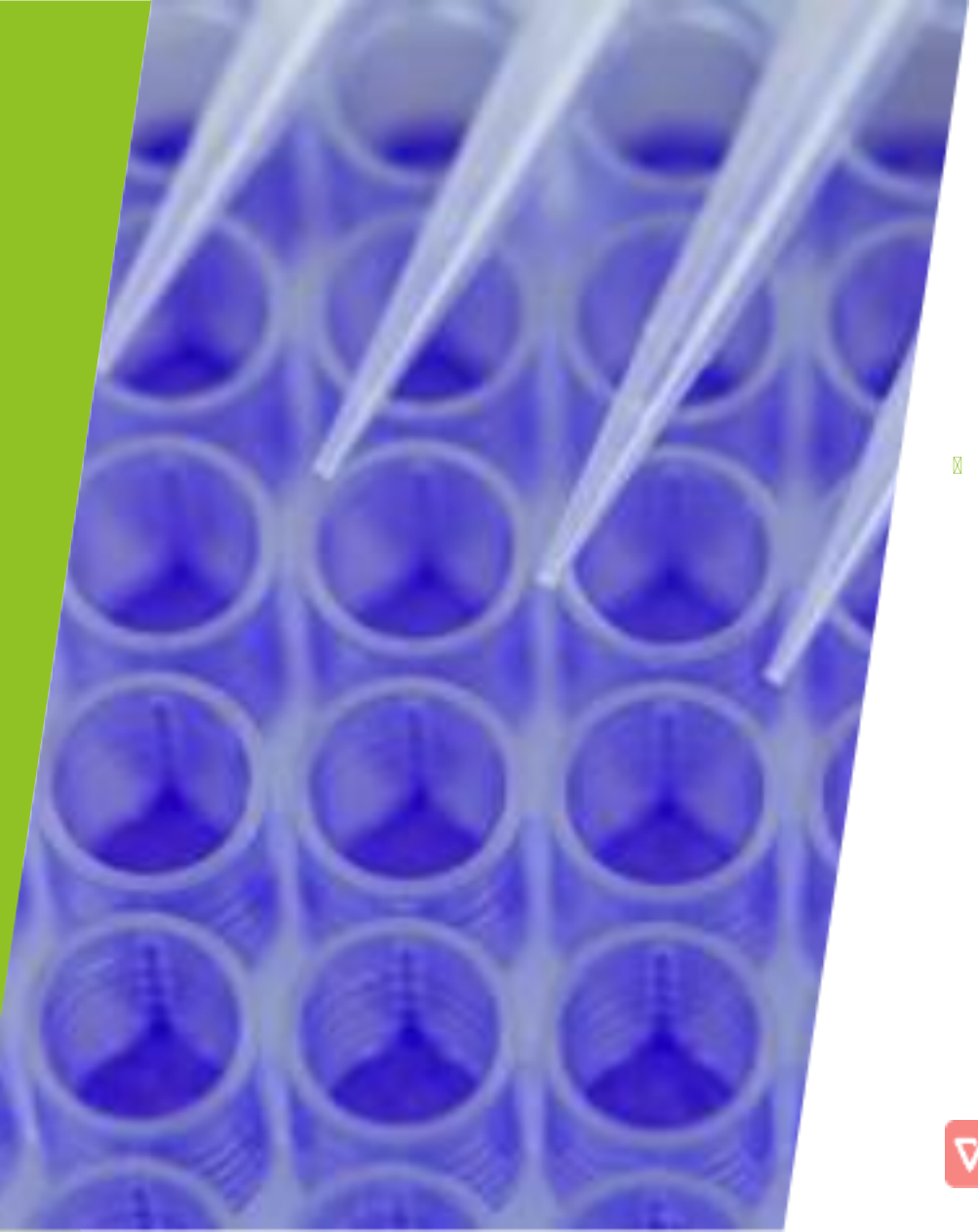
- Vials are also known as phial or flacon. These have a tubular or bottle-like shape with a neck. The volume of liquid by the neck is known as headspace. Vials are generally used in labs for chromatography which is a technique for separation of a compound mixture.
- A vial is a small container usually made of glass or plastic. It may be shaped like a tube or bottle and have a flat bottom, unlike common blood collection tubes. Vials are available with various caps to meet specific storage or handling requirements. Vials are typically used to store medicines or laboratory sample

Cuvette

- A cuvette is a piece of laboratory equipment that is intended to hold samples for spectroscopic analysis. While cuvettes can be made of various materials, plastic cuvettes have the advantage of being less expensive and disposable and are often used in fast spectroscopic assays
- The two most common cuvette materials are glass and quartz. Both options offer distinct advantages

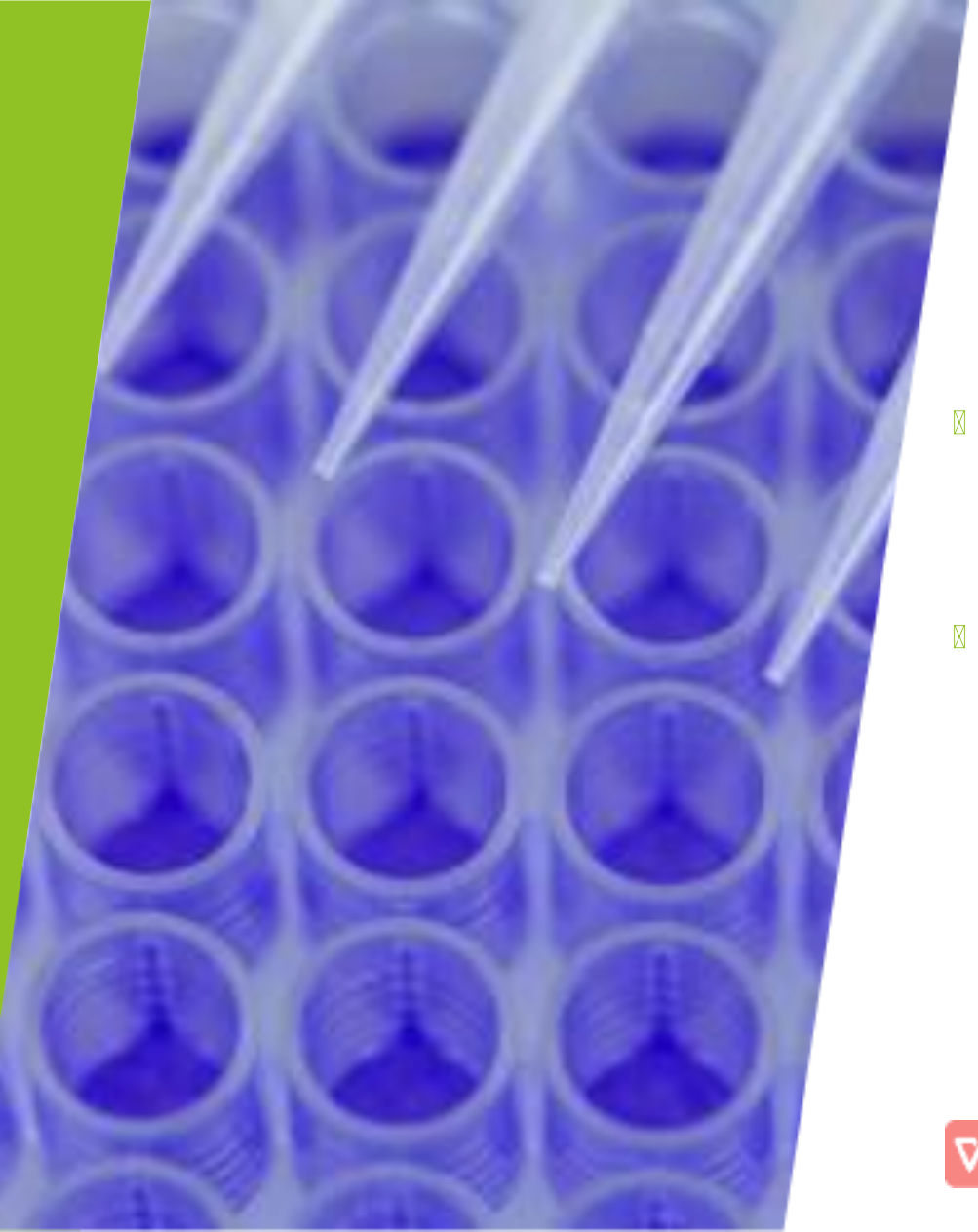
Manual Pipette

- Requires calibrating the pipettes, entering the desired volume in the pipette, and aspirating and dispensing the liquid by laboratory workers. It works best for laboratories dealing with small sample volumes because only a sample is processed at a time.



Disposable Pipette

- Practical one-piece plastic transfer pipettes (Pasteur pipettes), made from natural low-density polyethylene (LDPE). They are simple and safe to use and have a long shelf life – there are no issues with broken glass, cracked or loose bulbs. An additional advantage is that with the single piece design larger amounts can be transferred by allowing fluids into the bulb. These pipettes are ideal for transferring small amounts of fluids for microscopy specimen preparation or for prepare mixtures or staining solutions. The extra fine tip enables the transfer of minute amounts of fluids. These pipettes are disposable and intended for one-time use and are deal for educational and research environments. Can be used for fluids up to 70°C, but please take care to protect the fingers whilst squeezing the bulb



Disposable Tips

- Disposable tips ensure no cross contamination between samples. Disposable tips ensure maximum safety for the user.
- If your intent is to use one reagent in a multitude of different experiments, you could easily reuse the pipette tip because they are only using one product. However, when the need to use different reagents arises, it is time for a new pipette tip.

RBC Pipette

- RBC pipette is diluting pipette.
- RBC pipette is known as Red Blood Cell Pipette.
- The blood along with the RBC diluting fluid is drawn in the pipette and are mixed well through the red bead present inside the bulb of the pipette.
- The size of the bulb is larger in RBC pipette when compared to the size WBC pipette.

WBC Pipette

- WBC pipette is diluting pipette.
- WBC pipette is known as White Blood Cell Pipette.
- WBC diluting fluid is used for perfoming the WBC (Leucocyte) count.
- Draw EDTA anticoagulated blood to 0.5 mark in the capillary end of WBC pipette and Draw diluting fluid up to 11 mark.

SYRINGE

- Syringes are used in research labs for multiple tasks including injection of gases or liquids into chromatographs, chemical apparatus, or animals.
- medical device that is used to inject fluid into, or withdraw fluid from, the body. A medical syringe consists of a needle attached to a hollow cylinder that is fitted with a sliding plunger. The downward movement of the plunger injects fluid; upward movement withdraws fluid.

Petri Dish

- A **Petri dish is a cylindrical lidded dish made of shallow clear glass or plastic**, used to hold a thin layer of agar. Used to cultivate bacteria, fungi and other microorganisms
- The Petri dish is named after its inventor, Julius Richard Petri (1852-1921) who worked as an assistant to Robert Koch in Berlin at the Imperial Health Office. He developed a double dish, small, round, flat-bottomed with sides. One of the two dishes was slightly larger, serving as a lid and a shield.

Inoculating Loop and Needles

- **Inoculating loops and needles are hand-held and compact appliances that introduce microorganisms like bacteria or yeast into plated or tubed growth media before incubation, multiplication, or growth.** The inoculum is commonly delivered and disseminated into liquid media, streaked onto or stabbed into a solid agar-based medium, or both.
- An inoculation loop often referred to as a smear loop, inoculation wand, or microstreaker, is a basic instrument used largely by microbiologists to take and transfer a small sample (inoculum) of a microbe culture, for instance, to strip on a culture plate. It is a tool often constructed of nichrome or platinum wire, with a tip with a tiny loop with a diameter of around 2 mm to 5 mm.

Bacteriological Incubator

- The bacteriological incubator prominently cultivates a wide range of **bacteria** under controlled conditions. It has extensive use in research and medical laboratories.
- Bacteriological incubators provide an **enclosed environment** for the growth of bacteria. They work under the ideal temperature range of **35°C to 37°C**.
- Most bacteria grow best at a temperature of 37 °C and Incubation of 24-48hrs

Fume Hood

- fume hood is an enclosure that safely contains and ventilates hazardous fumes, vapors, gases and dust generated by chemical processes performed in the fume hood. Sometimes called a chemical hood or a lab hood, a fume hood protects workers from inhalation of hazardous substances.
- The clear sliding window on a fume hood, called the sash, also shields workers from spills and splashes that may occur in the chemical fume hood

Compound Microscope

- The term microscope can be split into two separate words, ‘micro’ and ‘scope’, where the term ‘micro’ means small or tiny, and ‘scope’ means to view or to observe. Therefore, a microscope can be understood as an instrument to observe tiny elements.
- The term “compound” in compound microscopes refers to the microscope having more than one lens.
- Devised with a system of combination of lenses, a compound microscope consists of two optical parts, namely the objective lens and the ocular lens.
- Occasionally very high magnification it required (e.g. for observing bacterial cell). In that case, an oil immersion objective lens (usually 100X) is employed.

Autoclave

- The terms **steam sterilizer** and autoclave are synonymous and can be used interchangeably. That said, autoclave is often used in laboratory settings, while **sterilizer** is more commonly heard in hospitals or pharmaceutical settings.
- is used to sterilize objects that are capable of withstanding extreme heat (250°F–285°F) (121°C–140°C) for 1 hour and pressures of about (16–35 pounds per square inch) . It is among the most accurate methods of sterilization . Its many advantages include microbicidal, sporicidal, nontoxic, cheap cost, relatively easy to use, and safe to use.
- Moist heat kills microorganisms by irreversible coagulation and denaturation of enzymes and structural proteins. In support of this, it has been found that the presence of moisture significantly affects the temperature of protein coagulation and the temperature at which microorganisms are destroyed. This process of sterilization rapidly destroys resistant strains spores.

OVEN

- are a common piece of equipment that can be found in electronics, materials processing, forensic, and research laboratories. These ovens generally provide pinpoint temperature control and uniform temperatures throughout the heating process.
- The following applications are some of the common uses for laboratory ovens: annealing, die-bond curing, drying or dehydrating, Polyimide baking, sterilizing, evaporating. Typical sizes are from one cubic foot to 0.9 cubic metres (32 cu ft).
- Standard digital ovens are mainly used for drying and heating processes while providing temperature control and

Centrifuge

- any device that applies a sustained centrifugal force—that is, a force due to rotation.
- Is a machine that uses centrifugal force to separate the contents of a sample based on their density. When the centrifuge spins, it creates a strong centrifugal force. Though separation would eventually happen naturally with Earth's gravity, the centrifuge machine delivers rapid results for laboratory and other applications.
- If working with clot tubes (those collected without anticoagulant), do not begin to centrifuge blood specimens until adequate clotting has occurred. Clotting generally occurs within 20 to 60 minutes at 22 to 25 degrees centigrade without the aid of clotting activators.
- **Recommended Centrifuge Time and Relative Centrifugal Force (rcf)**

Time: 10 +/- 5 minutes RCF: 1000 — 1200