Lab 2:
Laboratory equipment and glassware

Introduction

Medical chemistry laboratories use many **specialized instruments and glassware** to perform chemical analysis of biological samples such as blood, urine, and other body fluids. Proper use of these tools ensures **accurate results, safety, and reliable diagnoses**.

Laboratory tools are generally divided into two main categories:

- **Laboratory Equipment (instruments and devices)**
- **Laboratory Glassware**

Part 1: Laboratory Equipment

1. Centrifuge

A centrifuge is a device that separates substances of different densities by spinning samples at high speed.

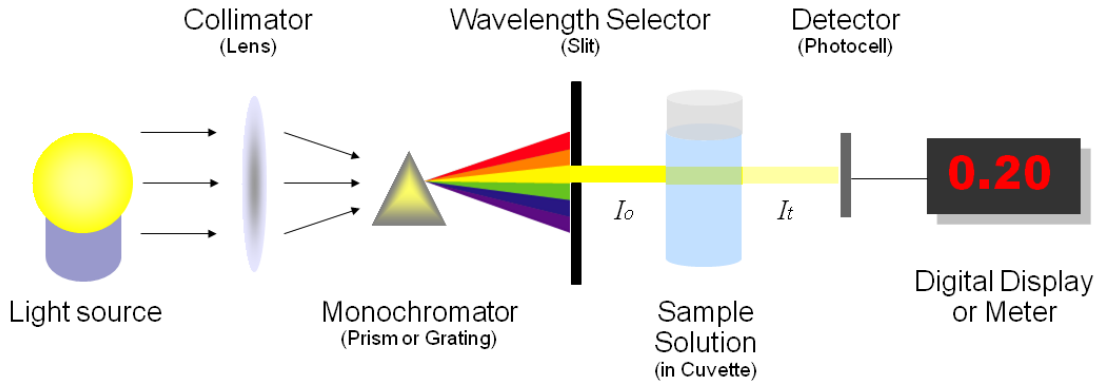
- which causes heavier particles to move outward to the bottom of the tube while lighter components remain at the top.

- **Uses in Medical Chemistry**
- Separation of **serum or plasma from blood**
- Separation of precipitates from solutions
- Preparation of samples before biochemical analysis
- Isolation of cellular components

- **Types of Centrifuges**
- **Clinical centrifuge** – used for routine blood tests
- **Microcentrifuge** – used for small sample volumes
- **Refrigerated centrifuge** – used for temperature-sensitive samples

2. Spectrophotometer

- **Definition:**
  is an analytical instrument used to measure the amount of light absorbed by a chemical solution to determine the concentration.
- **Uses:**
- Measuring chemical analytes concentrations in blood and other body fluids as glucose and Protein concentrations
- Enzyme activity measurement
- Drug concentration analysis
- **Principle:**
  Based on **Beer-Lambert Law**, where absorbance is proportional to concentration.



3. Incubator

- **Definition:**
  An incubator maintains a **constant temperature** for chemical or biological reactions.
- **Typical Temperature Range**
- Usually between **20°C and 60°C**, but microbiological incubators often operate at **37°C**.
- **Uses:**
- Microbial culture growth
- Enzyme reactions
- Chemical reactions requiring controlled temperature

4. Water bath

- **Definition**
- A **water bath** is a laboratory instrument used to **heat samples gently and uniformly using hot water**.
- **Temperature Range**
- Usually between **25°C and 100°C** depending on the experiment.
- **Uses in Medical Chemistry**
- Incubating chemical reactions
- Warming reagents and samples
- Enzyme activity tests
- Protein and biochemical assays

5. Laboratory Oven

- **Definition:**
  An instrument used to dry or sterilize laboratory materials using hot air.
- **Uses:**
- Drying glassware
- Sterilizing equipment and

Metal instruments

6. Analytical Balance

- **Definition:**
  A highly precise balance used to measure small quantities of substances.
- **Accuracy:**
  Typically, accurate to 0.0001 g (0.1 mg).
- **Uses:**
- Preparing reagents and standard solutions
- Measuring chemicals for experiments
- Quantitative analysis

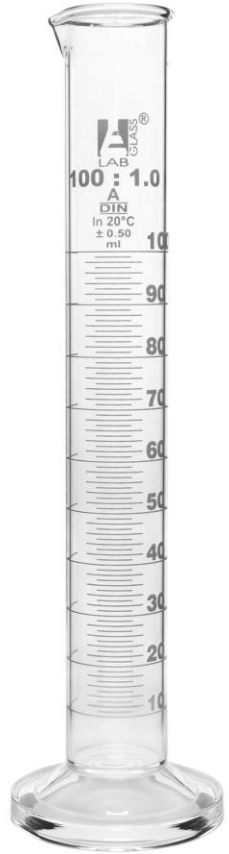
Part 2: Laboratory Glassware

1. Beaker

- **Description:**
  A cylindrical glass container with a flat bottom and spout.
- **Uses:**
- Holding liquids
- Mixing solutions
- Heating substances
- **Note:**
  Not used for precise measurements.

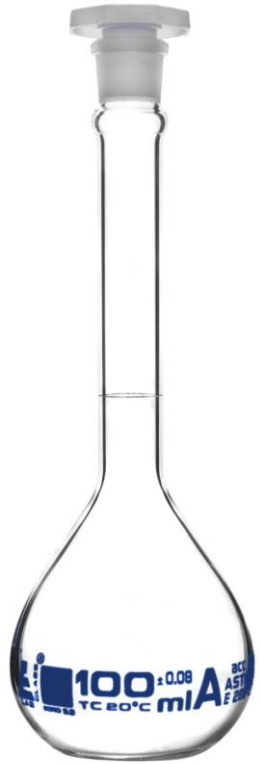
2. Graduated Cylinder

- **Description:**
  A tall narrow container used to measure liquid volumes accurately.
- **Features**
- Marked measurement scale (with many measurements marks)
- Narrow shape for better precision
- Stable base
- **Uses:**
- Measuring liquids
- Preparing solutions



3. Volumetric Flask

- **Description:**
  A flask with a narrow neck used to prepare solutions with precise volume.
- **Characteristics**
- Accurate volume measurement with one calibration line
- Narrow neck reduces measurement error
- Usually comes with a stopper



- **Uses:**
- Preparing standard solutions
- Diluting chemicals accurately

4. Funnel:

A cone-shaped glassware used to transfer liquids or powders into containers with narrow openings.

- **Uses:**
- Pouring liquids
- Filtration with filter paper

5. Watch glass:

A shallow circular glass dish used for small laboratory procedures.

- **Uses:**
- Evaporating liquids
- Holding small samples
- Covering beakers

6. Test Tube

- **Description:**
  A small cylindrical tube made of glass or plastic used to hold small amounts of substances.
- **Uses:**
- Chemical reactions
- Heating small samples
- Holding biological samples

7. Pipette

- **Description:**
  A glass or plastic tube used to transfer small volumes of liquid.
- It is more accurate than beaker or graduated cylinder for small volumes
- **Types of Pipettes**
- **Volumetric pipette –** measures a single exact volume
- **Graduated pipette –** measures different volumes
- **Micropipette –** used for very small volumes (microliters)
- **Uses**
- Transferring solutions
- Preparing standard solutions
- Clinical laboratory testing

8. Spatula:

A small tool used to transfer or handle solid chemicals.

- **Uses:**
- Moving powders
- Mixing solid chemicals

9. Dropper:

A small tube with a rubber bulb used to transfer liquids drop by drop.

- **Uses:**
- Adding reagents slowly
- Transferring small amounts of liquid

Good luck