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An Easy Guide for Practical Biochemistry

Second Edition

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Divya Shanthi D'Sa

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CHAPTER

Glasswares Used in Biochemistry Laboratory

INTRODUCTION

Various types of glasswares are used in the biochemistry laboratory to measure, prepare and transfer or to keep solutions, reagents and samples. These glasswares may be volumetric (graduated) or non-volumetric (non-graduated). Volumetric glasswares include flasks, measuring cylinders, pipettes, etc. Non-volumetric glasswares include beakers, funnels, bottles and test tubes, etc.

LABORATORY GLASSWARES

Beakers

Beakers are wide, straight sided cylindrical vessels available in a wide range of volumes from 50 mL to several liters. They are used mainly for the preparation of the solutions and reagents.

Flasks

These have capacities of 25–500 mL. Different types of flasks are available.

- *Conical flasks (Erlenmeyer type):* These are used for performing titration, and for boiling the solutions. Evaporation is minimum because of the conical shape

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- *Flat-bottomed round flasks:* These are used mainly for heating the liquids
- *Round bottomed flasks:* These can withstand high temperature. So, they are used to evaporate samples to dryness, distillation of water, alcohol and other organic compounds
- *Volumetric flasks:* They are flat bottomed, pear-shaped vessels with long narrow necks with a specific volume mark and fitted with a stopper.

Graduated (Measuring) Cylinder

Graduated (measuring) cylinders are narrow, straight side vessels that are used to measure specific volumes. They are available in sizes ranging from 10 mL to several liters. A high degree of accuracy is not possible because of their wider bore.

Burettes

Burettes are long, graduated tubes with a stop cork at one end, available in capacities of 10–100 mL. These devices are used to deliver known volumes of liquid into a container accurately. By measuring from one graduated line to another graduated line, one can deliver even fractional volumes (less than 1 mL) of liquid with a high degree of accuracy. They are used mainly for titrations and also to dispense corrosive reagents.

Funnels

Funnels are used to transfer liquids/solids into container, separation of solids from liquids. Funnels usually have short or long, thin stems. These funnels are used with filter paper to remove particles from solutions. Funnels with wide mouthed stems that allow solids to pass through easily are used for transferring solids into a container.

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Bottles

Reagent Bottles

Reagent bottles are cylindrical with a narrow neck fitted with stopper, available in various capacities of 25–2000 mL. They are made up of plain white or amber colored glass. Amber colored bottles are useful to store certain light sensitive chemicals like silver nitrate.

Drop Bottles

Drop bottles have a narrow neck with a slotted glass stopper, available in 50–100 mL capacities. They are used for delivery of drops of solutions such as stains and indicator solutions and are made up of white or brown glass.

Wash Bottles

Wash bottles are usually plastic bottles with a delivery tube at the top.

PIPETTES

Pipettes are used for delivery of accurate and controlled volumetric measurements. They are of various types differing in their levels of accuracy and precision which includes complex adjustable or automatic pipettes.

Manual Pipettes

- *To deliver (TD) type of pipettes:* These pipettes must be held vertically and the tip must be placed against the side of the accepting vessel to drain liquid by gravity. Common pipettes included under TD type are, graduated and volumetric pipettes

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- *Graduated pipettes:* These pipettes are available from 0.1–10 mL capacity, e.g. Mohr pipettes and serological pipettes. Mohr pipettes are glass tubes of uniform diameter with a tapered delivery tip, have graduations made at uniform intervals but well above the tapered delivery tip. These are mainly used for pipetting distilled water and reagents. However, 0.1 mL and 0.2 mL pipettes are used for pipetting specimen like blood, serum or plasma. The serological pipettes are either of TD or blowout pipettes
- *Volumetric pipettes:* These pipettes are not graduated but designed specially to deliver a specific quantity of the specimen. They have an open-ended bulb holding the bulk of the liquid, a long glass tube at one end that has the mark to describe the extent to which the pipette is to be filled and a tapered delivery portion. These pipettes hold and deliver only the specific volumes indicated at the upper end of the pipette. These are used mainly to pipette specimen and standards, and are very accurate

  Pipettes must be refilled or rinsed out with the appropriate solvent after the initial liquid has been drained from the pipettes.
- *Micropipettes:* Micropipette can deliver volumes ranging from 1–500 µL. It consists of capillary tubing with a line demarcating a specific volume. These are filled to the line by capillary action
- *Pasteur pipettes:* This pipette has a rubber bulb attached to the top of a glass tubing. It is tapered at the tip and is especially useful in delivering urine samples.

Auto Pipettes

Sucking and blowing with mouth is not done in auto pipettes. A mechanical plunger does this work. These are frequently used in the laboratory to repeatedly add a specific volume of a reagent. They are mainly of push button type (Eppendorf

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type) and are piston operated devices to dispense liquid. These pipettes may be of fixed volume type or variable volume adjustable type.

- *Fixed volume type:* The volume of the fluid sucked is fixed. Different pipettes are used to pipette different fixed volumes. It can dispense fixed volumes of 10 µL, 20 µL, 50 µL, 100 µL, 200 µL, 1000 µL as required
- *Variable volume adjustable type:* The volume of fluid to be dispensed can be adjusted with the adjusting screw as required. Variable volumes, e.g. 20–200 µL, 100–1000 µL are available.

TEST TUBES

Test tubes are of uniform thickness which can withstand mechanical and thermal shocks. Tubes with rim are preferred when reagent in the test tube is directly heated on the flame using a test tube holder. Test tubes are available in capacities of various volumes.

Outer diameter × length (mm):

- 10 × 75 mm—used for testing, identification of biochemical substances and as well as for centrifugation
- 15 × 125 mm—used for most of biochemistry tests
- 18 × 150 mm—for heating the reaction mixture directly on flame.

Centrifuge Tubes

Centrifuge tubes are either graduated or plain. They are usually conical shaped and their size is usually 17 × 120 mm.

Folin-Wu Tubes

Folin-Wu tubes have markings at 12.5 mL and 25 mL; they have a bulb at the bottom with a constriction. They are used for determination of blood sugar by Folin-Wu method.

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DISPENSERS

Dispensers are used to dispense large fixed volumes of reagents. They are usually used to dispense strong acids and alkalies.

DESICCATORS

Desiccators are used to keep solid or liquid materials dry. They usually have an area at the bottom where a desiccant (water absorbing material) is placed, which removes the water of hydration from compounds.

CLEANING OF GLASSWARE

Glassware should be thoroughly rinsed with tap water and cleaned with some detergents. Finally, it should be rinsed with tap water followed by distilled water. The apparatus can be dried quickly by rinsing with alcohol followed by ether. The cleaned glassware except the graduated glassware is dried in a hot air oven.

Dichromate-sulfuric acid mixture (chromic acid) is used for cleaning glasswares which removes even the last traces of grease.

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An Easy Guide for

Practical Biochemistry

Salient Features

- Thoroughly revised and updated text
- Deals with laboratory hazards and safety rules so that the students are cautious about the potential hazards, problems encountered and safety measures
- Analysis of various proximate principles of diet are dealt with in a simple methodical way as per the Syllabus
- Normal urine and abnormal urine tests are highlighted orienting towards understanding diseases
- Descriptive diagrams and colored depiction of all the tests help the students to visualize and remember the tests they perform
- Contains points to remember which highlights the importance of each chapter for quick revision
- Spotters are elucidated with composition and use for quick remembering
- Case reports with interpretations to motivate the students to interpret clinical symptoms with diseases
- Provides additional case reports to give a comprehensive glimpse on metabolism and to orient the students towards clinical aspects
- Objective Structured Practical Examination (OSPE) has been introduced giving an insight into the pattern of conduction.

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