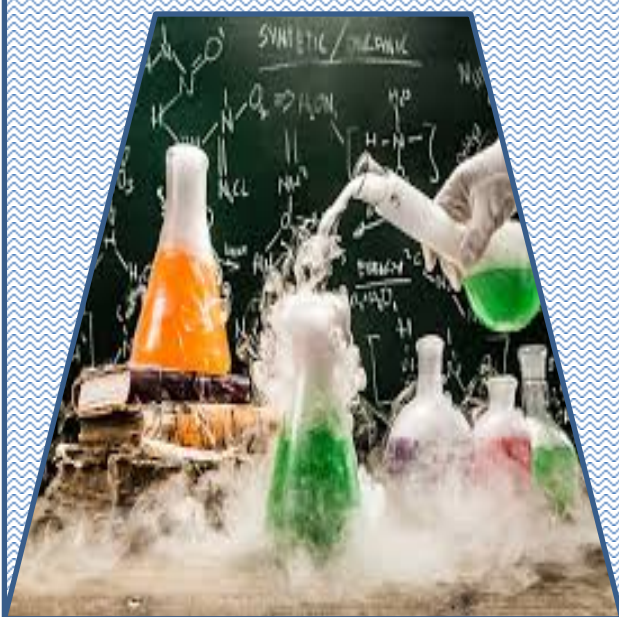
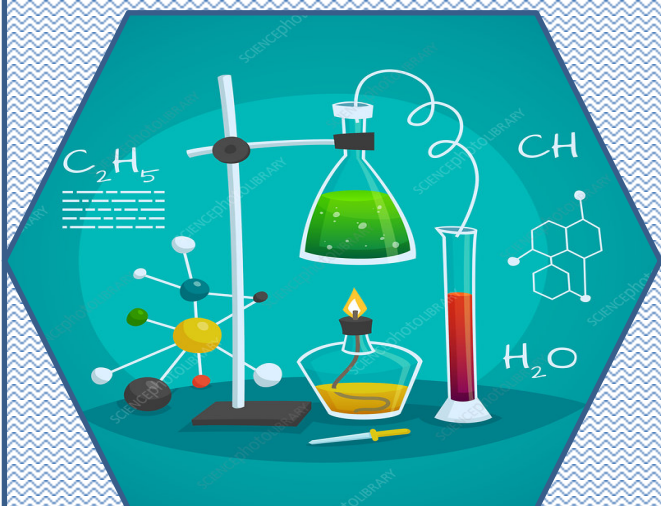




Women Dental College

Abbottabad-Pakistan



LAB MANUAL OF BIOCHEMISTRY

1ST YEAR BDS



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DESCRIPTION

Description: The Biochemistry laboratory at the Women Dental College is a distinguished and dynamic academic unit dedicated to advancing the understanding and application of biochemistry. Our department boasts a team of expert faculty members, whose research and teaching encompass a broad spectrum of biochemistry disciplines. Through state of-the-art laboratory and innovative instructional methods, we foster a stimulating learning pivotal role in contributing to the progress of dental healthcare.

Biosafety policy for Laboratory

The laboratory has detailed safety procedure guidelines regarding all aspects of laboratory work.

Purpose:

- To prevent or minimize the risk of illness arising from exposure to laboratory hazards.
- To ensure a safe and clean environment for work & monitor accidents, incidents or cross infection during practical work in the laboratories
- To ensure that equipment is used with standard protocols

General Safety Instructions

- Work carefully and cautiously in the laboratory, using common sense and good judgment at all times. No smoking, eating or drinking in the area where specimens or reagents are handled.
- EATING, DRINKING AND SMOKING IS PROHIBITED in the laboratory
- Long hair must be tied back during laboratory sessions.
Lab coats must be worn during work.
- Never pipette by mouth.
- Avoid contact of the skin and or mucous membranes with reagents. If accidental contact, wash abundantly with water.
- Needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.

Used, disposable, sharps must be carefully placed in puncture-resistant containers used for sharps disposal.

- Broken glassware must not be handled directly. Plastic ware should be substituted for glassware whenever possible.
- All labs and the preparation room house a first aid kit containing antiseptics, bandages, Band-Aids and gloves to care for minor cuts.
- Wear protective eyewear when conducting procedures that have the potential to create splashes. Gloves must be worn to protect hands from exposure to hazardous materials.
- Laboratories have a sink for handwashing. Follow standard hand washing practices
- Keep sinks free of paper or any debris that could interfere with drainage.
- Lab tables must be clear of all items that are not necessary for the lab exercise.
- Wash hands and the lab tables with the appropriate cleaning agents before and after every laboratory session

Emergency hazards

- Identify the location of all exits from the laboratory and from the building.
- Be familiar with the location and proper use of fire extinguishers, fire blankets, first aid kits, spill response kits and eye wash stations in each laboratory.
- Note the location of the desk phones that provide direct access to the Office of Management. In the event of an emergency, pick up the phone and state the location and the nature of the emergency.
- A white board with contact No. of Emergency Ward Master should be displayed for Emergency Contact

Open flames- Fire hazard

- Identify and be familiar with the use of dry chemical fire extinguishers that are located in the hallways and laboratory rooms. Flames are only to be used under the supervision of the instructor.

Sharp objects and broken glass

- Containers designated for the disposal of sharps (scalpel blades, needles, etc.) and containers designated for broken glass are present in each laboratory. Never dispose of any sharp object in the regular trash containers.
- All labs and the preparation room house a first aid kit containing antiseptics, bandages, Band-Aids and gloves to care for minor cuts and burns.
- Do not touch broken glass with bare hands. Put on gloves and use a broom and dustpan to clean up glass. Dispose of ALL broken glass in the specific container marked for glass. Do not place broken glass in the regular trash.

Noxious chemicals

- Material Safety Data Sheets should be available in binder in the laboratory. In case of a spill, an accident or a safety question, staff can find chemical safety information in the Data Sheets.

Chemical spill clean-up kits should be available in every lab.

Instruments and Equipment

Care must be used when handling any equipment in the laboratory. The staff responsible for being familiar with and following correct safety practices for all instruments and equipment used in the laboratory.

1. Microscope Handling

- a. Microscopes must be carried upright, with one hand supporting the arm of the microscope and the other hand supporting the base. Nothing else should be carried at the same time.
- b. Microscopes must be positioned safely on the table, NOT near the edge.

- c. After plugging the microscope into the electrical outlet, the cord should be draped carefully up onto the table and never allowed to dangle dangerously to the floor.
- d. The coarse adjustment must NEVER be used to focus a specimen when the 40x or oil immersion lens is in place.
- e. When finished with the microscope, the cord should be carefully wrapped/secured before returning it to the cabinet.
- f. The microscope must be placed upright and in the appropriate numbered slot in the cabinet.
- g. All prepared microscope glass slides are to be returned to their appropriate slide trays; wet mount preparations are to be disposed of properly.
- h. Malfunctioning microscopes should be reported to the instructor.

2. Water Baths and spirit lamps

- a. The instructor will regulate the temperature of water baths or spirit lamps with a thermometer.
- b. This equipment must be placed in a safe place.
- c. Use insulated gloves or tongs/holders to move beakers or test tubes in and out of the water baths.
- d. Use care when working near hot plates and water baths, as they may still be hot
Even after being turned off

Faculty Responsible for Course Conduction:

Sr. No	Faculty	Qualification	Designation
1	Dr.Madeeha Jadoon	MBBS, MPhil (Biochemistry) CHPE	Assistant Professor HOD
2	Dr Arusa Munir	BDS	Lecturer
3	Dr Momina Tahir	BDS	lecturer

Details of Supporting Staff:

Sr. No	Staff	Designation
1	Mr Shahzad	Lab technician and computer operator
2	Mrs Kiran	Lab Assistant
3	Miss Sonia	Lab Assistant
4	Mr Qari Naseer	Office boy

EQUIPMENT OF BIOCHEMISTRY LAB EQUIPMENT

COLORIMETER: A colorimeter is used to measure the absorbance of light of particular wavelengths in a specific solution. The different solutions absorb light of a different wavelength equal to the concentration of the solution when exposed to light. This is the basis of colorimetric or simply Beer-Lambert's Law. The colorimeter is used in various fields of science as well as non-science for measuring the concentration of solutions or density of the solution. In the clinical laboratory, a colorimeter is used to analyze urine, plasma, serum, and cerebrospinal fluids for biochemical studies.



MICROSCOPE: It refers to an optical instrument that uses a lens or an arrangement of lenses to magnify an object. Also, they help to view different organisms. Furthermore, the light of a microscope helps to see microorganisms. They are used in different fields for different purposes. In biochemistry lab, mostly these are used for identification of osazone crystal formed by different types of carbohydrates etc. Some of their uses are

tissue analysis, the examination of forensic evidence, studying the role of protein within the Cell, and the study of atomic structure



INCUBATOR: The incubator is an insulated enclosure in which temperature, humidity, and other environmental conditions can be regulated at levels optimal for growth, hatching, or reproduction. A laboratory incubator is a 5 heated, insulated box used to grow and maintain microbiological or cell cultures. The incubator maintains optimal temperature, humidity and gaseous content of the atmosphere inside. Many lab incubators include a programmable timer that may cycle through different temperatures and humidity levels. Lab incubators vary in size from table-top units to large systems the size of a cupboard.



CENTRIFUGE MACHINE: Centrifuges separate or concentrate substances suspended in a liquid medium by density. Space-saving fixed- and variable-speed benchtop or tabletop centrifuges are used for applications including tissue culture, protein work, DNA/RNA research, and cell harvesting. Parts of Centrifuge • Motor: Electric motor is a part of the centrifuge which helps to drive. • Control Panel: The control panel placed on the front casing serves the purpose of controlling centrifuge operation. • Chamber: The entire system is housed within a chamber. The extraction of fat from milk in order to produce skimmed milk. The removal of water from moist lettuce with the help of a salad

spinner. The Spin-drying of water in washing machines in order to move water from the clothing. The separation of solid blood and urine materials into forensic and testing laboratories.



BOILING WATER BATH EQUIPMENT: Boiling is the rapid phase transition from liquid to gas or vapor; the reverse of boiling is condensation. Boiling occurs when a liquid is heated to its boiling point, so that the vapour pressure of the liquid is equal to the pressure exerted on the liquid by the surrounding and evaporation are the atmosphere. two main Boiling forms of liquid vapourization. In science, boiling happens when liquid becomes gas, forming bubbles inside the liquid 7 volume. In cooking, water is the most frequently used liquid that is boiled. The temperature when water will begin to boil is around 212 degrees Fahrenheit/100 degrees Celsius. This is called the boiling point. A laboratory water bath is used to heat samples in the lab. Some applications include maintaining cell lines or heating flammable chemicals that might combust if exposed to open flame. A water bath generally consists of a heating unit, a stainless steel chamber that holds the water and samples, and a control interface.



DIGITAL BALANCE: Digital Balances are devices used to precisely measure the mass of an object. Digital Balance For Laboratory digital mass balances in the General Chemistry labs are very sensitive instruments used for weighing substances to the milligram (0.001 g) level. Please treat them with care. Use containers when weighing chemicals and always weigh objects at room temperature. Chemical balance is a beam balance instrument that is used in a quantitative measure of the chemical with great precision. It measures the mass of the chemical up to four decimal places. It is used in the quantitative analysis of the chemical. It has the ability to recognise any minimal deviation.



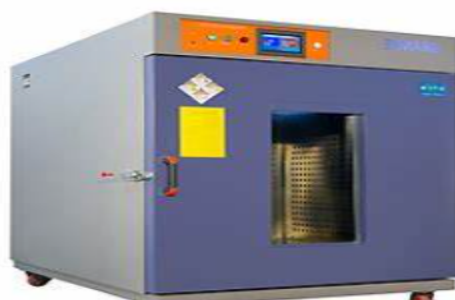
GLUCOMETER : Glucose meter or glucometer measures how much sugar is in the blood sample. The drop of blood you get with a finger prick is often enough to use on a test strip. A finger prick can be done with a special needle (lancet) or with a spring loaded device that quickly pricks the finger tip.



PH Meter: The PH meter is an electric device used to measure hydrogen-ion activity (acidity or alkalinity) in solution. A pH meter is an instrument used to measure. Hydrogen activity in solutions - in other words, this Instrument measures acidity/alkalinity of a solution. The degree of hydrogen ion activity is ultimately expressed as pH level, which generally ranges from 1 to 14



HOT BOX OVEN : A hot air oven is generally used for samples that are heat resistant and do not melt, change the form or catch fire on exposure to high temperatures. It generally kills microorganisms and bacterial spores at extremely high temperatures over several hours and sterilizes items. Effective sterilization can only be achieved when the appropriate temperature and holding time are selected depending on the type of microorganism being targeted and the type of material being sterilized



DISTILLATION UNIT: A water distiller is a special equipment designed to produce contaminant-free water by transforming water into vapor before condensing into a liquid state.



STOP WATCH:



APPARATUS:

Test tube:

They are usually cylindrical pipes made up of glass, with a circular opening on one side and a rounded bottom on the other. They come in different sizes but the most common standard size is 18*150 mm. Test tubes are one of the most important apparatus as they are functional from storing to mixing reagents in any chemical or biological reactions.

**Test tube holder:**

It is used to hold the test tube. It is used for holding test tube in place when the tube is hot or should not be touched.

**Test tube stand:**

It is used to hold multiple test tube in upright position at the same time.

**Glass funnel:**

Funnels are necessary equipment to pour substances and solutions in narrow-mouthed test tubes and conical flasks. There is variety of its available; the most common ones are filter, thistle, and dropping funnels.



Glass flask:

- **Conical flask:** It is an apparatus having a flat bottom and a long narrow neck, which allows easy mixing of the solution without spilling out the content. Since the flask has a narrow long neck, it is also used to gently heat the content inside with a gentle swirling motion of the flask. The flask can also be covered using a rubber cap or cork..
- **Boiling flask:** this apparatus has round bottom with a long neck. It can be capped using rubber or glass stoppers and is mostly used to hold solutions that can be easily heated with proper swirling motions for proper mixing.
- **Volumetric flasks:** This is one of the most important glassware of any lab, which is made up of glass and is calibrated to hold a precise volume of liquids at any precise temperature. Different sizes of volumetric flasks are available, each calibrated for exact measurement of liquids and solutions. It is mostly used in the preparation of standard solutions.



Conical flask



Boiling flask



Volumetric flask

Beakers:

Beakers are cylindrical utensils, with a flat bottom and the upper opening having a rim around it along with a spout. The spout on their rim's aids in the proper pouring of solutions and they do not have any covering on the top. Most of the time watch glasses are used to cover their solutions.



Graduated cylinders:

These are some cylindrical apparatus with several markings up and down the length of the container with the primary function dealing with proper measurement of a specific volume of liquid with precision. While taking readings, one needs to be careful to take into consideration the reading with respect to the meniscus of the liquid.



Dropper:

It is a common small apparatus, usually made up of plastic or glass cylinder, having a small nozzle on one side and a rubber holder on the other. It is used to put the liquids or solutions in any medium dropwise, that is, one drop at a time, necessary equipment when any reagent is required in an extremely small amount in a solution.



Pipettes:

Pipettes are of varying sizes, designed for accomplishing specific goals of volumes. These are narrow glass cylindrical pipes, used for measuring an exact volume of liquid and placing it into another container.



Burettes:

A very popular equipment, mostly used in the titration reactions, and is a handful in delivering a known volume of any substance to other equipment. This apparatus is a long-graduated tube, with a stopcock present at the lower end and a narrow opening at the bottom. They are usually set up by using a burette clamp in combination with a ring stand. It usually comes in the sizes of 10ml, 25ml, or 50ml.



Spatulas and scoopulas:

These laboratory spatulas are very much similar to the kitchen like spatulas found in our home but they are just very smaller in size in comparison. The spatulas are usually resistant to heat and acids, hence making them suitable for large range use in the laboratory experiments.



Litmus and filter papers:

These two cannot be called apparatus in a proper way, but they serve as one of the most important and basic things that will be required in any kind of laboratories. The litmus paper serves to identify the pH of any solution by changing colors whereas, the filter paper serves in the filtration process.



Bunsen burner:

This apparatus produces a single open flame and it is used for heating and sterilization purposes in the various experiments conducted in labs.



Safety goggles:

One must wear safety goggles in the chemistry lab. It protects the eyes from irritation that may arise from any chemical or fumes coming out during the experiment. In case of any accidental splashing of chemicals or acids, it also protects us from the blindness of the eyes .



FOUNDATION MODULE

Theme III: Development of Human Body & Human Dentition

S.NO	TOPIC	TIME	LEARNING OBJECTIVES
1	DETECTION OF POLYSACCHARIDES	2 HRS	PERFORM IODINE TEST
2	DETECTION OF MONOSACCHARIDES	2 HRS	PERFORM BARFORD'S TEST
3	DETECTION OF REDUCING AND NON-REDUCING SUGARS	2 HRS	PERFORM BENEDICT TEST

Theme IV: Organization of Human Body & Human Dentition

S.NO	TOPIC	TIME	LEARNING OBJECTIVES
1	SOLUTIONS	2 HRS	Prepare 0.9% NaCl Measure the PH of given solution

Gastro-Intestinal Tract (GIT) & Uro-Genital System (UGS)

Theme V: Obesity and beyond

S.NO	TOPIC	TIME	LEARNING OBJECTIVES
1	IDENTIFY THE PROTEINS IN GIVEN SOLUTION	4HRS	Identify the proteins in given solution.

Theme VII: Edema

S.NO	TOPIC	TIME	LEARNING OBJECTIVES
1	PROTEIN ANALYSIS	4HRS	Perform the procedure of protein analysis
2	. SERUM UREA	2HRS	Perform the procedure of estimation of serum urea.
3	SERUM CREATININE	2 HRS	Perform the procedure of estimation of serum creatinine
	URINE ANALYSIS	4HRS	Identify the normal and abnormal constituents of urine

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HOD BIOCHEMISTRY

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