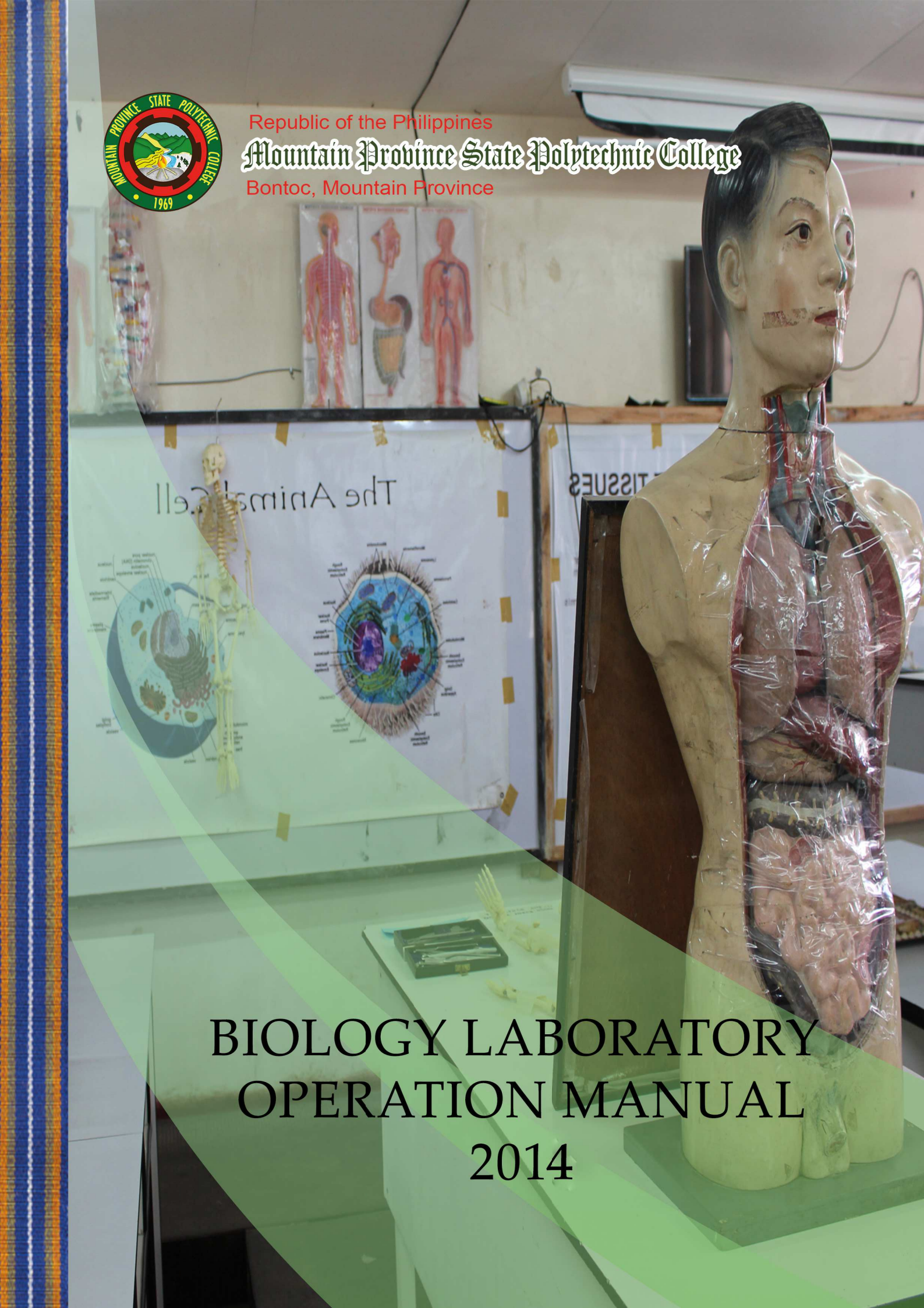

Republic of the Philippines

Mountain Province State Polytechnic College

Bontoc, Mountain Province

BIOLOGY LABORATORY OPERATION MANUAL 2014

Introduction

The Biology laboratory room was established as an instructional resource for the completion of academic or college-related work. The foremost goal is to provide students with a comfortable academic environment to perform class requirements, by using up-to-date technology. Further, to encourage and assist students and faculty to optimize their scientific knowledge and skills through classroom activities, training and individually pass learning.

Each person has the responsibility to use the existing equipment for appropriate uses and in a proper manner. The following policies and procedures are intended to help in the operation, scheduling, maintenance and security of the laboratory.

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CHAPTER 1
POLICY FOR APPROPRIATE BIOLOGY LABORATORY USAGE

It is important for everyone to realize that there is attached responsibility to the Instructor including the students every time they use the Biology laboratory room during class and experiment sessions.

Biology Laboratory Guidelines and Policies for Students:

In using the Biology laboratory facilities, the student:

1. Must follow rules on the use of the laboratory room such as the prohibition of drinking, eating or smoking in the laboratory room.

2. Must not perform any unauthorized experiments.

3. Must conserve gas, water and materials of any kind used in the laboratory.

4. Must observe proper disposal of solid waste and chemical waste used in the experiment.

   a. The solids must be disposed by placing them in waste cans, unless they are readily soluble in water.

   b. The gutter must be used for the disposal of water only.

   c. Small amounts of corrosive flammable liquids may be flushed down the sink with plenty of water. Larger amounts of such solvent should not be poured off in the sink.

   d. Table or floor spilled with acids or bases must be washed immediately with plenty of water.

5. Agrees to be careful in handling laboratory apparatuses and equipment.

6. Must be cautious in performing experiments and in handling chemicals. The student must observe the following precautions in performing experiments and in dealing with chemicals:

a. Always wear laboratory gown and goggles when performing experiments.

b. Avoid inhaling fumes of any kind. Use a well- ventilated hood if heavy or toxic vapors are being produced.

c. Never taste chemicals unless directed by the instructor.

d. Do not use mouth suction in filling up pipettes with chemical reagents.

e. Use spatula for solid reagents; do not handle them with bare hands.

f. Handle concentrated acids with care; avoid spilling them on clothing or any part of the body especially the eyes. If this should happen, wash the affected area with plenty of water and report to your instructor.

g. Always pour concentrated acid into water. Never pour water into acids.

7. Agrees not to work alone in the laboratory.

8. Informs the instructor of any problems occurring with the use of the equipment.

9. Must turn off water and gas supply and make sure that the working area is clean before leaving the laboratory room.

10. Understands that violation of the above mentioned conditions is subject to corresponding sanctions by the appropriate authorities. Accidents due to negligence of students shall be the sole responsibility of the students concerned.

11. Agrees that the above conditions shall remain for as long as enrolled student uses the Biology facilities.

Biology Laboratory Guidelines and Policies for Instructors:

1. In using the Biology laboratory facilities, the Instructor must follow the following guidelines and policies:
   - When the laboratory is used for instructional/laboratory purposes, the Instructor is responsible for the supervision and conduct of the students during the entire class or laboratory period. During the assigned time, only the enrolled students for the subject should be in the room. The Instructor has the authority to send out anyone who is not a member of the class.
2. The following becomes the added function of the Instructor during the conduct of
   - The Instructor is responsible for the efficient functioning of the laboratory during regular student usage.
   - The Instructor should report all defective apparatuses/equipment which were issued before the conduct of laboratory experiments or activities.
   - The Instructor is responsible for securing the laboratory when leaving. The entrance and exit to the laboratory must be locked and secured when the laboratory is vacated.
   - The Instructor assigned for the scheduled time needs to be present before the students are allowed to enter the laboratory room.
   - The Instructor is responsible for maintaining the equipment in the laboratory during the experiment session by reporting problems to the laboratory in-charge.
   - The Instructor sees to it that the laboratory and workstations must be left tidy for the next users.

Basic Rules in the Biology Laboratory Cleanliness, Orderliness and Discipline

1. Before Experiment
   a. Wear your laboratory gown.
   b. Clean your working area/table, sink, and floor.
   c. Arrange all stools.
   d. Set all your personal belongings on the shelves under the working tables.
      - No other things should be placed on top of the working table except when those materials are needed in the experiment.
      - Secure all personal belongings (money, calculators, cellphones etc.) In your pockets.
   e. Accomplish completely the requisition slip to necessary materials from the stockroom.
      - Double check your list before going to the stockroom counter.
      - Request for additional equipment/chemicals will not be entertained at the stock room.
      - Double check the quantity and condition of the material needed for particular experiment upon issuance at the stockroom counter.
      - Bring out your material from the class locker.
      - Prepare the list and labels of the reagents needed for the experiment.
      - Prepare the apparatuses needed.
      - Get the reagents from the dispensing section.

2. During the Experiment
   a. Set all the materials (chemicals, apparatus and others) on the working table.
   b. Position yourself around the working table where you can visualize and observe the experiment procedures and results.

c. Perform the experiment systematically.
d. Record significant observation.
e. Double check whether you have obtained the required data in the experiment.

3. After the experiment
   a. All the leaders must present their note-books/manuals signed by the faculty.
   b. Leaders collect checked manuals of members and must affix their signatures/date. They must make sure that materials are returned to the stockroom. Wastes and unused reagents must be disposed properly. Glass wares are washed and wiped dry. Working table, or working area is cleaned.
   c. Class materials must be returned in lockers.
   d. Faculty must inspect group area.
   e. Faculty should dismiss the class by group.

Biology Laboratory Guidelines and Policies on Borrowing Apparatuses or Equipment

1. Issuance of apparatuses/ equipment shall be made only when the borrower presents a duly accomplished borrower's slip.

2. Request for apparatuses/equipment should be made one (1) day before the actual performance of the activity.

3. All borrowed items should be returned on time with conditions that all apparatuses/equipment are clean and dry before they are returned.

4. The borrower is held responsible from any damage or loss of apparatuses/equipment during the laboratory period.

5. In case of breakage or loss, the borrower must replace the broken item. All borrowed items that were damaged during the performance of activities must be repaired before they are returned.

Note: In purchase item for replacement, the concern student should get the proper specification from the Laboratory In-charge before buying. Replacement with wrong specification will not be accepted.

Procedures in Borrowing Laboratory Apparatuses and Equipment

1. Read carefully the laboratory activity before securing a borrower's slip
2. Identify the needed apparatuses/ equipment for the activity.
3. Secure borrower's slip from the laboratory in-Charge.
4. Fill out the borrower's slip properly.
5. Let the respective laboratory professor sign the borrower's slip.
6. Submit the fully accomplished borrower's slip to the laboratory in–Charge with valid school ID.
7. Wait for the requested apparatuses/equipment.

CHAPTER 2
GENERAL RULES AND REGULATIONS

Biology Laboratory Conduct:

- Scheduled classes are given priority over other users.
- Eating, drinking, smoking or chewing tobacco/momma shall strictly be prohibited inside the laboratory.
- Students who destroy any laboratory apparatus or equipment in the lab shall be held financially responsible. Fines for replacement shall be determined according to the value of the damaged items and shall be assessed by the Laboratory custodian.
- Appropriate attire is required (laboratory gowns and face masks required).
- Do not let another person use the apparatuses/equipment assigned to a certain group.
- The use of Biology laboratory room must be limited to laboratory classes only. The use of such rooms for other purposes requires permit from the General Services Office.
- Failure to adhere to Biology laboratory policies and procedures may result to permanent suspension of laboratory privileges.

CHAPTER 3

HAZARD CODE & FIRST AID TREATMENTS NUMERICAL HAZARD CODE

- Chemicals vary as to degree of hazard. The following hazard codes serve as basis in the cautious handling of chemicals.
- Substances are rated on a scale of 0 (non-hazardous) to 4 (extremely hazardous) in each of four hazard categories:

Health hazard – the danger or toxic effect a substance presents if inhaled, ingested, or absorbed.

Flammable hazard – the tendency of a substance to burn.

Reactivity hazard- The potential of a substance to explode or react violently with air, water or other substances.

Contact hazard- the danger of a substance present when exposed to skin, eyes and mucous membranes.

Rating Scale

4	3	2	1	0
Extreme	Severe	Moderate	Slight	None

FIRST AID TREATMENTS/LABORATORY SAFETY

1. Chemicals

- For acid in the eye, wash thoroughly with running water; then by means of a cup, wash with 2% sodium bicarbonate solution. Dry with sterile gauze pad and apply several drops of olive oil into the eye.

2. Cuts

- First, wash with water thoroughly; then apply 50% alcohol or tincture of iodine. Bandage with sterile gauze. Do not continue to use iodine in subsequent dressings. Burns will result. Never cover directly with adhesive tape.

3. Burns

- For acid burns, wash first the affected area with running water and then with saturated sodium bicarbonate solution. Cover for about ten minutes with solid sodium bicarbonate. Wash off, dry with gauze and go to the clinic for further treatment.

- For heat burns, apply Vaseline or ask for burn ointment from your instructor or laboratory technician.

4. Liquid splash on the eye

- Wash immediately with water from an eye wash bottle or eye wash fountain.

5. Chemical splash on the skin

- Immediately rinse the area with cold water for at least one minute. Notify your instructor for further action.

6. Fire

6.1 Small fire

- First, turn off the gas, then smother the fire with a wet towel. Otherwise, use the fire extinguisher provided for this purpose.

6.2 Clothing on fire

- Smother fire by covering yourself with a jacket or by rolling on the floor. In general, do not use water. This will only hasten the spreading of fire.

CHAPTER 4
BASIC PROCEDURES, TECHNIQUES AND OPERATING PROCEDURE OF LABORATORY APPARATUSES/EQUIPMENT

LABORATORY PROCEDURES

Basic Laboratory Separation Techniques

A. Separation Technique

A.1 Solid Reagents

- Use the spatula to spoon out the solid from the reagent bottle. To transfer a solid reagent to a test tube, place the reagent on a piece of paper (for about 10 cm^2). Roll the paper to form a cylinder, slide it into the bottle to form a vertical position, and gently tap the paper.

A.2. Liquid Reagents

- When pouring liquids from one container to another, a glass rod or funnel is used to guide/direct the flow of the liquid and prevent spilling. After pouring the desired amount of liquid, slide the rim of the bottle upward on the rod as it is removed, to prevent drops dripping down the side of the bottle.

B. Heating Chemicals

B.1. Solid Reagents

1. Solid in a test tube
   - Heat the reagents gradually by moving the test tube in and out of the flame.
2. Solid in a crucible
   - Position the crucible on top of the clay triangle supported by an iron ring attached to an iron stand or supported by a tripod.
3. Solid in an evaporating dish or beaker
   - Allow solid only up to ¾ at most in the vessel. Position it on a wire gauze supported with an iron ring or tripod.

B.2. Liquid reagents

- In heating liquid in a test tube, allow liquid only up to ¾ at most in the test tube. Only the tube with the liquid portion

should be placed above the flame in a slanted position and not the bottom. When it begins to boil, remove the test tube from the flame. Do not point the open end towards anyone including yourself.

C. Separation of Solid Liquid Mixtures

C.1 Decantation

- The mixture consisting of a solid and a liquid mixture (in which the solid is insoluble in the liquid) is allowed to stand undisturbed for some time. On standing, the solid particles settle on the li-quid. The liquid is then carefully poured off into another container, leaving the solid particles in the original container.

C.2 Filtration

- The mixture consisting of a solid and a liquid (in which the solid is insoluble in the liquid) is poured off through a filter paper. The liquid passes through the filter paper, while the solid is held and collected on the filter paper.

C.3 Evaporation

- As a method of separation, it is usually employed to separate the components of a solid-liquid solution in which the solid is soluble in the liquid. Evaporation of the solution is usually done in an evaporating dish.

C.4 Sublimation

- Sublimation is the conversion of a solid substance directly into a gaseous state.

C.5 Extraction

- Process most frequently used. It involves the treatment of a solution with a second solvent by shaking the two together. The two solvents must be mutually insoluble (immiscible) in each other. After shaking, the two solvents separate into distinct layers, or phase, with solvent of lesser density floating on the other. In the separation the immiscible liquid is passed through

a separator funnel.

COMMON MEASURING TECHNIQUES

A. Measuring Volumes of Liquids in the Laboratory

- The graduated cylinder, volumetric flask, burettes, and pipettes are used to measure liquid volumes. When measuring volumes with these devices, read the lower meniscus for transparent liquids and the higher meniscus for opaque liquids. Read the same point in the meniscus consistently for a given li-quid. Hold the apparatus vertically straight. Line of vision must be perpendicular to the scale.

1. Graduated Cylinder

- used for approximate measurements with accuracy not greater than 0.5%.

- The volume of the cylinder that should be used should not be more than 10 times the volume to be measured.
- It should not be used for measuring hot boiling liquids because it is not heat resistant.

2. Burette

- used in measuring accurate volumes of liquids to be delivered into the reaction flask. The two kind's burettes are: (1) acid burette with glass stopcock and (2) base burette with a rubber connection bearing a glass delivery tip and pinchcock. The rubber prevents "freezing of a glass cock by the alkali".

3. Pipette

- used for accurate measurements of volumes to be transferred from one vessel to another.

Techniques in Handling a Pipette

a. When using a pipette always use a rubber suction bulb to protect you from chemical and the liquids from contamination.
b. Rinse it with the liquid to be measured before you use.
c. After rinsing, add enough liquid to the beaker to fill the pipette above

the mark. Avoid sucking air into it. Dip its tip into the liquid.

d. Remove the excess liquid. Hold the pipette vertically. Let the air enter the stem by manipulating your index finger to allow the liquid to flow out slowly into the beaker. Do this until the liquid meniscus coincides with the calibration mark.
e. Insert the tip of the pipette well inside the receiver. Hold it vertically and tilt the receiver so that its tip touches the wall of the receiver. Allow the liquid to flow freely down the wall of the receiver.
f. If you do not have a rubber bulb, use mouth suction for nontoxic liquids but always keep the pipette tip below the liquid level. Suction by mouth should never be done with corrosive or volatile liquids.

Techniques in Using Volumetric Pipette

a. Draw the liquid past the graduation mark.
b. Use the index finger to maintain liquid level above graduation mark.
c. Tilt pipette slightly and wipe away any drop on the outside surface keeping.
d. Allow pipette to drain freely.

4. Volumetric flask

- Strictly for volume measurement at room temperature.
  - Do not put hot liquid into it; it's not heat resistant.
  - Use glass rod to transfer a liquid into the volumetric flask.
  - When the liquid rises quite close to the mark or the neck of the flask, use medicine dropper to add the li-quid, drop by drop, until the lower meniscus of the liquid column coincides with the mask.

How to Use the Volumetric Flask

a. Check the flask for cleanliness, rinse with distilled water of about 30 ml. Shake out excess water. There is no need to dry.
b. When adding the solution, carefully place the stem of the funnel inside the flask. Transfer the solute from the watch glass into the funnel and flask. Wash the solute into the flask using the wash bottle, being careful so that all of it will go to the flask. Then remove the

glass and funnel into the flask.

c. When adding a solvent, add sufficient distilled water to fill the flask about three quarters full.

d. Put the stopper and shake thoroughly to dissolve the solute.

e. When dissolving the solute, add the final amount drop by drop using a teat pipette. Keep the eye level with the meniscus. Stop adding the solvent when the bottom of the meniscus and the graduation mark coincide.

B. **Determining Mass**

1. Equal Arm Balance - used to measure a material by comparing its weight (force of gravity) with the weight of standard masses.

- When the pans are balanced, the material and the standard masses are the same.
- The single beam is graduated for 10g in 0.1 g divisions. The balance is sensitive to 0.1g and therefore read to 10g without any additional masses.
- The capacity is 200g.
- Analytical masses should never be used with this rough balance. There are rough sets of masses for this purpose.

2. The Triple Beam Single Pan Balance

- Used for semi-micro masses and has a maximum capacity of 111g.
- The middle scale reads up to 100g in 10g-notched steps, the rear scale to 10g in 1g-notched and the front scale with the rider sliding over a scale.

Steps in Determining the Mass of an Object Using Platform Balance

a. The pans should be cleaned with a dry cloth.
b. The masses should be placed on the beam at zero position.
c. The pointer should be checked if it swings equally to the left and to the right or if it is at zero position.
d. The dry object to be weighed should be placed on the left pan. (Chemicals should never be placed directly on the pan. A container, e.g. wax paper should always be used.
e. Measurements should always start with heavier rider, then 1-g mass rider on the beam to the 1g position. If the right pan is still higher than the left pan, it means that the object is heavier than the mass on the beam. The rider should then be moved to the next notch until the right pan becomes lower than the left pan.
f. The 1g rider should be moved one notch back. Then 0.1g mass rider should be moved until the pans are on the same level or the pointer swings equally to the right and the left of the scale.
g. If objects with more than 11g are weighed, use additional masses on the right pan.
h. The masses should be added up.

How to Handle the Balance

a. When transferring the balance from one place to another, it should be carried with the left hand supporting the base and the right hand on the pointer support.
b. The pan arrester should be placed when the balance is not in use or when stored to protect its delicate knife edge.
c. Powdered or granular solids to be weighed should be placed on a piece of glazed paper. The mass of which must have been previously determined to prevent possible reactions of the solid with the metal pans.

d. Glassware to be weighed should be dried first.
e. If the pointer does not swing equally to the left and to the right of the scale before weighing any object, the level screw under the base of the balance should be adjusted.

3. Electronic Top loading balance

How to use the electronic top loading balance

- The electronic top loading balance is very sensitive. Extra care must be taken when it is being used.

a. Bring tissue paper with you to the balance room. The balance and the table should be clean. If not, call the attention of your instructor.
b. If you are to weigh your samples on a piece of paper, make a paper box before going to the balance room.
c. The read-out must be 0.000 g before you place your sample container on the balance pan. If not, press T (Tare).
d. Gently place your sample container (beaker, watch glass or paper) on the balance pan.
e. Gently add your sample to the container. If the weight overshoots the required amount, gently remove the container from the balance pan before taking out the excess sample. DO NOT REMOVE EXCESS SAMPLE WHILE THE CONTAINER IS ON THE BALANCE.
f. If the weight of the container is not needed, press T (Tare) to adjust the weight to zero. DO NOT WIPE ANY SPILLAGE ON THE BALANCE PAN WHILE THE BALANCE IS ON. Call you instructor and he/ she will clean the balance for you.
g. In a logbook provided, print your name, indicate your laboratory section and the time you used the balance.
h. Clean the table before leaving the balance room.

DON'TS

- Do not lean/ sit on the table where the balance is placed.
- Do not press anything except T (Tare).

- Do not turn off the balance.
- Do not stay in the balance room if you are not going to use the balance.

C. **Using the pH meter**

How to Use the pH meter

1. Load/check the battery.
2. Prepare the electrode. Carefully handle it because it is the most sensitive part of the pH meter.
3. Calibrate the standard solutions. PH measurement requires daily calibration of the instrument against set standards to even out effects of temperature.
4. Measure the pH of the test solution.
   - If the test solution is acidic, calibrate using pH 4.01. If the solution is basic use a standard pH 9.0.
   - Pour 3cm^3 of test solution into a beaker. Take the temperature of the solution. It should be the same as the standard, pH values change with the temperature.
   - Immerse the electrode into the test solution. Take the reading of the solution as soon as possible for the adjustment of the pH meter does not remain stable for a long time.
   - After taking the pH reading of the test solution, repeat it for the 3rd trial, take the average reading.
   - Turn the switch off. Remove the electrode from the meter. Wash the electrode with pure water. Put the protective cap back with distilled water.
   - Store the electrode and container in a cool dry place.

Storing and Maintaining the pH meter

- After measurement, switch off the pH meter.
- Using a wash bottle, rinse the electrode thoroughly especially the part between the electrode and the protective cover.

- Put the protective cap containing KC solution on the electrode membrane.
- When the electrode membrane becomes dry, immerse the electrode in pure water for a few hours or in 0.1 M hydrochloric acid for about 30 minutes. Then rinse it with pure water before you use. Care must be taken not to let the liquid junction part be soaked with water or hydrochloric acid.
- If the electrode membrane gets contaminated and can be removed with pure water, clean it using gauze or other soft materials moistened with dilute soap solution, or dip it into solution of about 0.1N hydrochloric and chromate acid mixture.
- Rinse thoroughly with pure water and immerse into pure water for a few hours. Do not let the liquid junction part be soaked by soap solution, hydrochloric acid and chromate acid cleansing solution.
- Replenish the inner solution when the temperature of the inner solution is the same as that of the solution to be measured.
- Do not dip the electrode into the liquid, it requires high insulation.

D. **Using the binocular microscope**

How to Operate the binocular microscope

1. Match the voltage selector switch to local mains voltage on the light source
2. Place a specimen slide on the mechanical stage.
3. Coarse focus with the **1OX** objective.
4. Make interpupillary distance and diopter adjustments.
5. Adjust the condenser position**.**
6. Swing in the desired objective.
7. Adjust light intensity.
8. Fine focus.
9. Adjust aperture iris diaphragm and field iris diaphragm.

OPERATION

A. Switching on the Light Source

1. Ascertain that the voltage selector switch is set to conform with the local mains voltage. If the switch is not correctly set, adjust it by means of the Allen wrench provided or a screwdriver.
2. Place the sliding voltage control lever on the right side of the microscope base to a position closest to you (low voltage position). As you push the control lever in the direction of the arrow in order to obtain increasing intensity, the LED readout will display the lamp voltage.

B. Placement of a Specimen Slide

1. Rotate the coarse adjustment knobs in the direction of the arrow to rack down the stage so that a specimen slide can be placed on the stage.

   NOTE: The rotation of the coarse and fine adjustment knobs in the direction of the arrow will rack down the stage.
2. Opening the spring-loaded finger of the specimen holder with one hand, place a specimen slide inside the holder.

   When the slide comes in contact with the back of the specimen holder, slowly return the spring-loaded finger.

   WARNING: If the spring-loaded finger is returned quickly, it may cause damage to the specimen slide.
3. Bring the portion of the specimen for observation into the light path by means of the low drive control knobs.

   Tighten the stage clamping screw in the microscope front.

C. Interpupillary Distance Adjustment

1. Click the 10X objective into position.
2. Looking through the eyepieces with both eyes, adjust the interpupillary distance of the binocular tube by adjusting the

knurled dovetail slides @ of the right and left eyepiece tubes with both hands until perfect binocular vision is obtained.

Diopter Adjustment

1. Look at the image through the right eyepiece with your right eye and focus on the specimen with the fine adjustment knobs.
2. Next, look at the image through the left eyepiece with your left eye and rotate the dioptre adjustment ring @ to focus on the specimen without using the coarse and fine adjustment knobs.

Light Path Selection

1. The trinocular tube is provided with a light path selector knob to direct the light to the observation tube and or to the photo tube in 3 positions.

D. **Condenser Adjustment**

1. Stop down the field iris diaphragm with knurled ring by rotating in the direction of the arrow.
2. Use the condenser height adjustment knob to move the condenser up and down until an image of the field diaphragm can be seen clearly in the eyepieces. The rotation of the knob in the direction of the arrow lowers the condenser.
3. Bring the field iris diaphragm image into the center of the field of view with the two condenser centering knobs.
4. Widen the diameter of the iris diaphragm progressively. If the polygonal image of the iris diaphragm becomes inscribed in the field it means that the field diaphragm is centered.

E. **Adjustment Tension of Coarse Adjustment Knobs and Fine Adjustment**

- Although the tension of the coarse adjustment knobs has been already adjusted for optimum performance by the manufacturer, it is possible to personally adjust the tension of the coarse adjustment for either heavy or light movement depending on the operator's preference by rotating the tension adjustment ring.

- The ring can be rotated by inserting a screwdriver into one of the holes on the periphery of the ring. The clockwise rotation (in the direction of the arrow) tightens the coarse adjustment knobs. Do not loosen the ring too much, because the stage may drop or the fine adjustment knobs may slip.

NOTE: Do not rotate the right and left coarse adjustment knobs in the opposite directions simultaneously. If the stage drops and the specimen goes out of focus, the tension adjustment ring is too loose. Tighten the ring.

F. Use of Immersion Objectives

1. Focus the specimen with a low power objective.
2. Put a drop of immersion oil on the specimen slide and the front lens of the immersion objective.
3. Turn the revolving nosepiece to bring the immersion objective into the light path, and focus with the fine adjustment knobs.

NOTE: For immersion condensers such as an achromatic-aplanatic condenser or Abbe condenser, remove the specimen from the mechanical stage and place a drop of immersion oil on the front lens of the condenser. Then, place the specimen on the stage and slowly raise the condenser until firm contact with the underside of the specimen slide is made. Care should be taken to prevent oil bubbles from for-ming in the oil film between condenser and specimen slide. If any, re-apply immersion oil, for these bubbles greatly deteriorate the lens performance. Thereafter, carefully wipe off the immersion oil depo-sited on the lens surfaces with gauze moistened with xylene. Never leave oil on the lens surfaces after you use because oil remnants will seriously impair the performance of the lens system.

G. **Using the Table Top Centrifuge Machine OPERATION/ MAINTENANCE MANUAL OF TABLE TOP CENTRIFUGE**

OPERATION:

1. Check the electrical specifications at the back of the centrifuge first in order to meet the local electrical codes.
2. Plug cord in a properly grounded receptacle.
3. Place the test tubes in the tube adaptors. Be sure to place the tubes diagonally to keep the rotor balanced.
4. Lock the cover completely.
5. Dial preset your desired time by turning the control knob for any spin interval from 0 – 60 minutes. The equipment is working in timer-activated operation.
6. When the timer is turned clockwise, the pilot lamp will light up at the same time which indicates the power up.
7. Adjust the control knob of speed regulator to bring speed to your desired operation speed and centrifugal force.
8. The centrifuge does not include the speed indicator, the reference of speed and RFC is depicted. Nevertheless, the user is recommended to measure the speed by hand held LCD tachometer in order to achieve a correct speed and RCF.

Note:

Speed and RCF vary slightly from centrifuge to centrifuge. The power will shut down automatically when the set time has elapsed and the pilot lamp will extinguish simultaneously.

WARNING:

- Open the lid only until the rotor has stopped completely.
- Do not stop the rotor manual, there is a possibility of personal injury.

CLEANING DIRECTION

1. Disconnect from power supply prior to cleaning.
2. Clean the equipment after every use.

3. Use a moist cleaning cloth to clean the case, rotor and tube holders.
4. Dry the equipment thoroughly before operation.
5. Do not immerse the equipment in water.
6. Never use benzene or paint thinner for cleaning.