Republic of the Philippines

Mountain Province State Polytechnic College

Bontoc, Mountain Province

CHEMISTRY LABORATORY OPERATION MANUAL 2014

VISION

A preferred university of developmental culture and inclusive growth.

MISSION

It shall produce globally competitive leaders molded from a tradition of excellence in instruction, research, effective governance, sustainable entrepreneurship and an environment that assumes major responsibility in cultural vitality and well-being of the community.

GOALS

1. Attain and sustain quality and excellence for university hood;
2. Promote relevance and responsiveness;
3. Broaden access and equity;
4. Enhance efficiency and effectiveness; and,
5. Develop harmony within the College, and with stakeholders and benefactors.

MAJOR THRUSTS

H - Hearty Approach to Management & Governance, & Transformational Leadership
E - Enriched Academic Programs
R - Relevant Student Services, Development, and Welfare Program
I - International and Local Linkages
T - Technology, Facilities, and Assets Enhancement Program
A - Aggressive Staff Development and Welfare Program
G - Gainful Resource Generation and Enterprise Development Program
E - Excellent Researches and Relevant Extension

RATIONALE

The Operation Manual contains all essential information for the users to make full use of the different laboratory equipment and apparatuses present inside each laboratory room.

This manual includes a description of the functions of the different apparatuses, policies and guidelines (for both students and instructors) in using the laboratory room and apparatuses, precautionary measures inside the laboratory rooms and step - by -step procedures for each apparatus access and use.

INTRODUCTION

The Chemistry laboratory room was established as 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 student and faculty to optimize their scientific knowledge and skills through classroom activities, training and individually passed 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.

PREFACE

The Chemistry Laboratory Operation Manual is designed for college instructors and students especially for those who are enrolled in subjects with laboratory and utilizes the laboratory room for their laboratory period.

The contents of the manual have been arranged such that the policies and guidelines (on cleanliness, do's and don'ts, operation of the room, precautionary measures) for both instructors and students comes first.

The manual includes all the functional old and newly procured apparatuses and equipment. It follows the name of the apparatus, how to operate it and the safety measures in handling each apparatus.

SUMMARY PAGE

The Chemistry Laboratory Manual contains the rules, policies, guidelines, safety tips, laboratory conduct and appropriate laboratory usage which both instructors and students should be aware of and abide while inside the laboratory room. It also includes the guidelines to be followed in borrowing needed apparatus and equipment.

Aside from that, the revised manual incorporates the pictures of the different apparatuses and equipment ready as reference for both instructors and students. It was designed to update all the newly procured apparatus and equipment present in the laboratory including the operation, maintenance and safety measures in using each of the apparatus.

Contents Page

PAGE

Contents Page

PAGE

CHAPTER 1

POLICY FOR APPROPRIATE CHEMISTRY 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 Chemistry laboratory room during class and experiment sessions.

Chemistry Laboratory Guidelines and Policies for Students

In using the Chemistry 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, filter paper and materials of any kind.
4. Must return reagent bottles promptly to their proper places.
5. 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 it is 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 on the sink.
    d. Table or floor spilled with acids or bases must be washed immediately with plenty of water.
6. Agrees to be careful in handling laboratory apparatuses and equipment.
7. 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.
8. 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.
9. Always pour concentrated acid into water. Never pour water into acids.
10. Agrees not to work alone in the laboratory.
11. Informs the Instructor of any problems occurring with the use of the equipment.
12. Must turn off water and gas supply and make sure that the working area is clean before leaving the laboratory room.
13. 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.
14. Agrees that the above conditions shall remain for as long as enrolled student uses the Chemistry facilities.

Physics Laboratory Guidelines and Policies for Instructors:

1. In using the Physics 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

laboratory classes:

- 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 can 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.

CHAPTER 2

CHEMISTRY LABORATORY CONDUCT

1. Scheduled classes are given priority over other users.
2. Eating, drinking, smoking or chewing tobacco/ momma shall strictly be prohibited inside the laboratory.
3. Students who destroy any laboratory apparatus or equipment in the laboratory 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 custodians.
4. Appropriate attire is required (laboratory gowns and face masks required).
5. Do not let another person use the apparatuses/equipment assigned to a certain group.
6. The use of Chemistry, Biology and Physics laboratory rooms must be limited to laboratory classes only. The use of such rooms for other purposes requires permit from the General Services Office.
7. Failure to adhere to Chemistry laboratory policies and procedures may result in permanent suspension of lab privileges.

CHAPTER 3

CLEANLINESS, ORDERLINESS AND DISCIPLINE INSIDE THE LABORATROY

1. Before Experiment

a. Wear your laboratory gown.

b. Clean you're working area/table, sink, and floor.

c. Set all your personal belongings on the shelves under the working tables:

No other things should be placed on top the working table except those materials needed in the experiment.

Secure all personal belongings (money, calculators, cellphones etc.) in your pockets.

d. Accomplish completely the requisition slip as to necessary materials from the stockroom.

- Double check your list before going to the stockroom counter.
- Request for additional equipment or chemicals will not be entertained at the stock room.
- Double check the quantity and condition of the material needed for a particular experiment upon issuance from 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 observations.

e. Double check whether you have obtained the required data in the experiment.

3. After the experiment

a. All the leaders must present their notebooks/manuals signed by the faculty.

b. Leaders collect checked manuals of members and affix their signature/date.

They must make sure that:

- Materials are returned to the stockroom.
- Wastes and unused reagents must be disposed properly.
- Glassware are washed and wiped dry.

Working tables or working areas are cleaned.

c. Class materials must returned in lockers.

d. Faculty must inspect group area.

CHAPTER 4

CHEMISTRY LABORATORY GUIDELINES 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 for 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.

6. All borrowed items that were damaged during the performance of activities must be repaired before they are

Note: In purchasing items 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.

Procedure in Borrowing Laboratory Apparatuses and Equipment

FLOWCHART	RESPONSIBLE	DETAILS
Identifies the needed apparatuses/ equipment for the activity.	Instructor	Laboratory instructor will identify the needed apparatuses/equipment for the activity basing from the activity sheet.
Submits the list of needed apparatuses/equipment	Students	Students will submit the list of needed apparatuses/equipment to the laboratory custodian.
Issues borrower's slip	Laboratory Custodian	Laboratory custodian issues borrower's slip basing from the list of needed apparatuses/ equipment.
Fill-up borrower's slip	Students	Students will fill-up properly the borrower's slip basing from the list of needed apparatuses/equipment.
Borrower's slip be signed by the instructor	Instructor Student	Students will bring the borrower's slip to the instructor for him/her to sign if the apparatuses are all listed.
Yes / No Form duly	Student	Student will submit duly accomplished borrower's slip to the laboratory custodian one (1) day before the actual performance of the activity.
Prepares requested apparatuses or equipment	Laboratory Custodian	Laboratory custodian will prepare the requested apparatuses following what is listed in the borrower's slip.
Signs borrower's slip and issue requested apparatuses/equipment	Laboratory Custodian	Laboratory custodian will sign the borrower's slip and issues requested apparatuses/equipment on t he day of the activity.
Gets issued apparatuses / equipment together with the borrower's slip.	Student	Students will get the apparatuses from the laboratory custodian together with the borrower's slip. Borrower's slip ill be returned to the laboratory custodian together with the apparatuses after the activity.

CHAPTER 5

HAZARD CODE AND 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

a. First Aid for Chemical Burns

- Rinse the chemical off the skin w/ cool gently running water for at least 20 minutes.
- Remove any contaminated clothing and jewelry.
- Gently wrap the burnt area with sterile gauze or clean cloth if available.

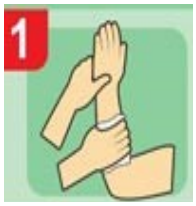
· Do try to neutralize the chemical with acid or alkali.

· Do not apply ointment or other topical treatments.

b. Chemical in the Eye

- Tilt the head so that the injured eye is downward, thus preventing the chemical to run into the unaffected part.
- Keep the eye open gently with your fingers and rinse out the eye with cold running water for 10-15 minutes.
- Apply a loose sterile eye dressing or a clean piece of cloth over the injured eye.

c. First Aid for Cuts and Scrapes

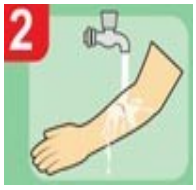


1. Stop Bleeding.

· Apply gentle pressure w/ sterile gauze or a clean cloth.

· Elevate the wound.

· Do not lift the gauze or cloth to check if the bleeding has stopped; this can restart bleeding.



2. Clean the wound.

- **Rinse the wound w/ clean water.**
- **Do not use soap, iodine, alcohol or hydrogen peroxide; this can be irritating to the tissue already injured.**

d. First Aid for Poisoning

3. Apply antibiotic.

- **Once the wound has stopped bleeding and has been rinsed clean, apply a thin layer of antibiotic cream or ointment to the wound.**

4. Cover the wound.

- **Keep the wound covered with an adhesive bandage or sterile gauze as it heals; this will keep the wound clean and prevent infection.**
- **Change the wound covering twice daily and keep the wound clean.**

In case of poisoning, the following first aid measures can be taken:

· Fresh air— If the person has inhaled the poison, then he must be allowed to intake fresh air immediately, as soon as possible.

· Dilution—In case of intake of poison through mouth, the person must be made to drink water or milk in order to dilute the poison.

- Do not induce vomiting. Turn the person to a left lateral position, keep the victim's chin raised at a slight angle and call for immediate medical help. (This helps keep the airway clear and allows better circulation of blood)

CHAPTER 6

BASIC LABORATORY TOOLS, PROCEDURES AND TECHNIQUES

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 avoid the flow of the liquid from 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.

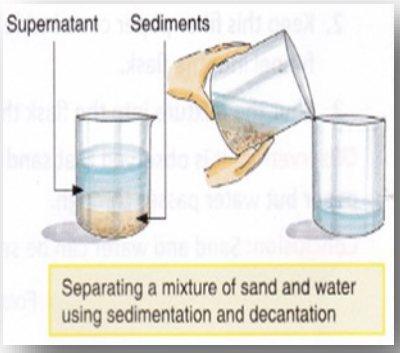
B.2 Liquid reagents

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 of the test tube towards anyone including yourself.

C. Separation of Solid Liquid Mixtures

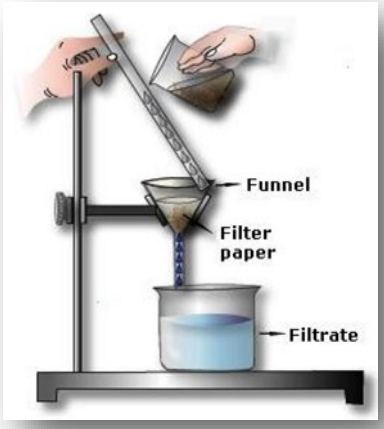
C.1 Decantation

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 at the bottom. The liquid is then carefully poured off into another container, leaving the solid particles in the original container.



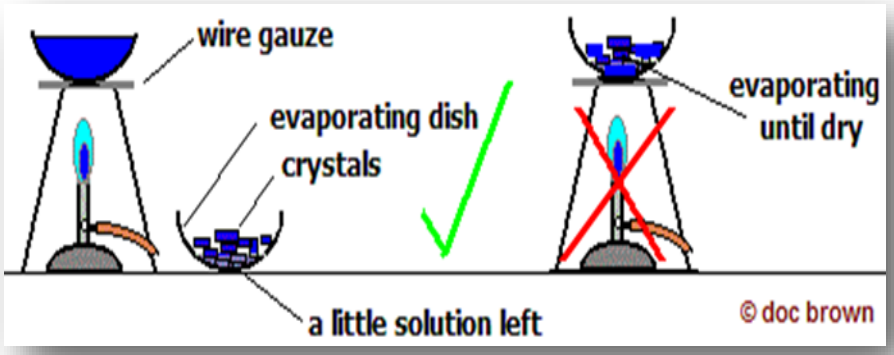
C.2 Filtration

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.



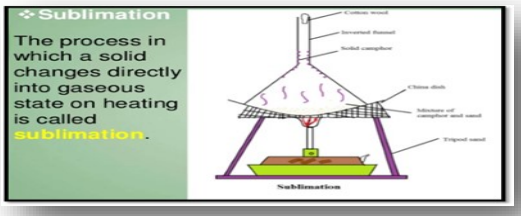
C.3 Evaporation

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.



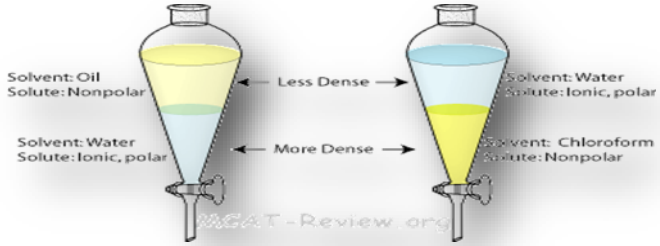
C.4 Sublimation

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



C.5 Extraction

- This process is 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 liquid. 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 kinds of 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 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 liquid, 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.

f. Shake to make the solution homogeneous. Stopper the flask and shake well. Remember to shake again before use.

B. Determining Mass

1. The Triple Beam 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 Triple Beam 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, (eg. 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.

2. 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. Use tissue paper to wipe the balance and the table before using.

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 your 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.

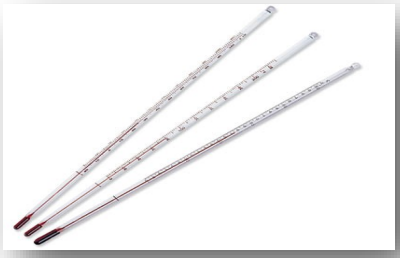
DON'TS:

- 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. Measuring Temperature

Thermometer

- Use to take the temperature readings, the eyes must be at the same level with the top of the mercury columns.



Safety Precautions when Using the Thermometer:

1. Do not hold the mercury bulb of the thermometer. It is prone to breaking.
2. If the thermometer breaks, collect the broken glass and mercury (Hg) by passing a copper (Cu) sheet or wire over each droplet. Place the collected Hg in a bottle, then add enough water to submerge all of it.
3. Cover tightly and store for future use. All accidents involving Hg must be reported to the teacher and the area affected by Hg spill must be thoroughly cleaned by the method just prescribed.
4. Do not play with Hg nor let it come in contact with jewelries. Hg is very volatile, its vapor is poisonous. On contact with gold or silver, mercury coats the metal and reduces the quality of gold/silver pieces.
5. Insert a thermometer into a cork or rubber Stopper, lubricate the thermometer and stopper with water or little oil. Hold the thermometer with a piece of cloth near the end. Insert using a twisting motion. This will prevent breaking the thermometer at the point of stress.

D. Using the Bunsen Burner

How to Use the Bunsen Burner

1. Lighting a Burner

**** Warning!!** Burns are the most common form of laboratory accident.

- After heating an object, be extremely careful to let it cool touching/holding it. Temperatures in the hottest region of the flame approach 1500 degrees Celsius. Before using a burner, be certain that no flammable materials are present in the laboratory. Also be careful to make sure that your face, clothing and hair are not above or near the opening of the burner tube.

2. Adjusting the Burner

- After lighting the burner, it must be properly adjusted. In a properly adjusted Bunsen burner, there will be blue flame containing two or more cones.

3. Heating Substances

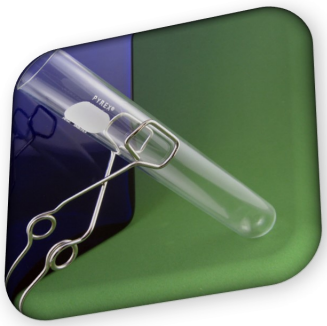
- Never use your finger to hold the object in the Bunsen burner flame. Instead, use a pair of tongs to hold a small, solid object. If the object is large or a liquid in a flask, use an iron stand with ring and a clay triangle or wire gauze to hold the object in the flame.

4. Extinguishing the Bunsen Burner

- After you are finished extinguishing the burner, turn the gas completely off to cut the gas supply.

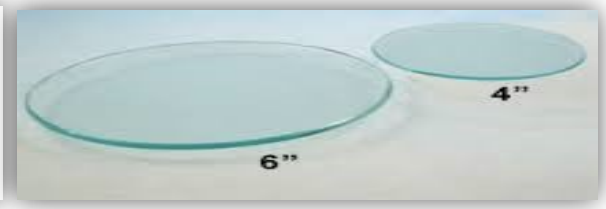
E. Laboratory Glass wares

1. Test tube



- May be heated
- Holding small amounts of chemicals and for small reactions

2. Watch glass

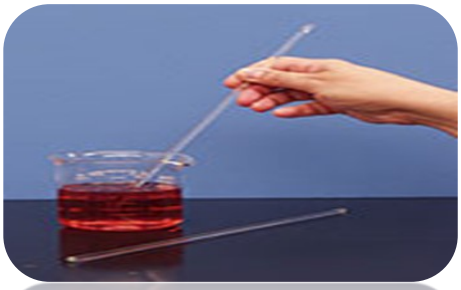


- Used as a beaker cover
- Can be used to place small amounts of chemicals on (looks like a contact lens)

3. Petri dish

- A petri dish is a type of glass or plastic shallow round dish with a close fitting lid which is a vital tool in scientific laboratories.
- The uses for this piece of equipment are varied, but it is most well-known for holding a culture medium upon which cells, bacteria, and viruses can be grown and studied

4. Stirring rod



- Glass rod used for stirring
- BE CAREFUL! They break easily.

5. Funnel

- Holds filter paper for filtering solutions.
- Transferring liquids to smaller narrow necked containers

6. Condenser

- Is a device used in the laboratory to cool hot gases into liquids. It is usually a long, circular glass tube. Inside the tube there is another, smaller tube. The hot gas goes through the smaller, inside tube, while in the outside one cold water goes around. Water can be put in from the tap, and goes from the bottom to exit at the top. This makes sure the tube is always full of water, so that cooling is quick.

- Used for example in distillation, where the hot vapor needs to be cooled down back to liquid to be collected. It is also used in reflux where it makes sure that the solvent used does not boil and go away.

7. Separatory Funnel

Use of a Separatory Funnel

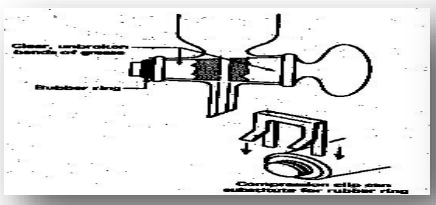
a. Stopper

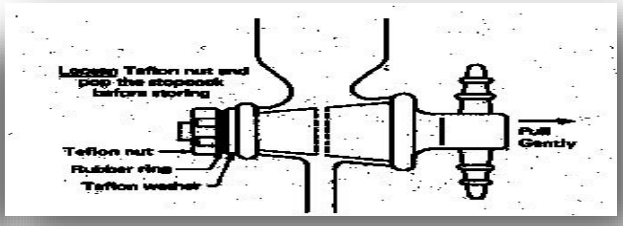
The stopper on top can be made from glass (used above) or Teflon.

- It is imperative that it fits tightly, so that the solution does not leak out when the separatory funnel is inverted.
- If a ground glass joint does not fit perfectly, a *minute* amount of grease is applied to the upper part of the joint to get a better seal.
- **The stopper has to be removed when draining the lower layer**. If the stopper were not removed, a vacuum will build up above the liquid upon draining. This vacuum will reduce the rate of draining and ultimately stop it completely. After some time, the vacuum will suck air in (from the stem) and the phases will mix again.

b. Stopcock plug

- The stopcock plugs can be made from glass (shown on the left below) or Teflon. It is important to have a good seal here as well.
- Again, a very *small* amount of grease can be applied to the glass plugs (shown on the left) to improve the seal and allow for better movement of the plug. The grease should be used sparingly, because it will clog up the hole in the plug!





- The glass plug has to be held in place with a metal clip. Teflon plugs usually possess a thread (some glass manufacturers offer those version for glass plugs as well), which allows to place a nut on it to hold it in place. Teflon plugs should not be lubricated!
- In order to find out which plug is needed, the glass joint has to be examined. Glass stopcocks require a ground glass joint (looks milky if clean and is rough on the inside). Teflon stopcocks use a polished joint (clear). Do not attempt to fit a glass stopcock into a Teflon joint! The slopes on the plugs are slightly different and the joint will break!
- The hole of the plug has to be open and match up with the holes in the stem and separatory funnel.

c. Before you start

- Perform the following tests before you start. Suspend the separatory funnel in an iron ring (make sure it does not fall through!) While the stopcock is closed, pour ~20 mL of a liquid (i.e., water) into the separatory funnel (with a short stem funnel).

- Check if the solvent leaks out at the stopcock. If this does not occur, place the stopper on top and invert the funnel. Does the liquid leak out now? If not, place the funnel back in the ring stand and remove the stopper. Open the stopcock and drain the solvent.

- If the solvent does not drain, you probably used too much grease to lubricate the stopcock. Pour the solvent out and remove the stopcock plug and check the hole. If it is clogged, use a wooden applicator or piece of wire to open it up. Put it back into the stopcock, secure it and start over with the tests.

- It is better to solve problems in the beginning and not with your product solution in the funnel later on. Note that it is not necessary to dry the separatory funnel.

d. Performing an Extraction

d.1. Place the separatory funnel in an iron ring. Remove the stopper and make sure that the stopcock is closed.

d.2. Add the solution to be extracted using a short-term funnel. Do not fill the funnel more than half at this point. Add the washing/extraction solution and place the stopper on top. There should still be some room afterwards (75 % of total volume).

d.3. Take the separatory funnel out of the ring and hold it tightly at the stopper and the stopcock. Invert it slowly and vent (open the stopcock) towards the back of the hood. You will hear a kind of whistle when the pressure is released.

d.4. Close the stopcock and shake the funnel gently, watching out for emulsions. Vent it again. Repeat this step until no more gas escapes.

d.5. Place the separatory funnel back in the iron ring. Allow the layers to separate. Then remove the stopper and drain the bottom layer into a clean container. At this point, you need to know which layer contains your desired product.

WARNINGS!

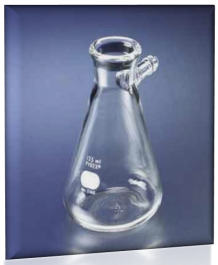
- If you extract or wash acidic solutions with sodium bicarbonate or sodium carbonate solutions, carbon dioxide will form due to an acid-base reaction. A significant pressure will build up in the funnel. Hence, you need to be more careful in the beginning and vent more often. $H^+ + HCO_3^- \text{ -----> } H_2O + CO_2$
- If you use low boiling solvents like diethyl ether, pentane, dichloromethane, chloroform, etc. for extraction, you will observe a significant build-up of pressure as well.
- Due to the pressure build up, you will need to hold on to the stopper and stopcock very tightly. It might be a good idea to wrap a paper towel around the stopper and joint.

When you vent the funnel, point the stem of the funnel away from everybody, so that the solvent and gases released are not blown into somebody's face. The best protocol is to vent it in the back of a hood.

⇒ **Never throw any layer away, until you are absolutely sure that you isolated your final product.** It is easier to isolate it from a small amount of solution than from the waste container.

- If you are not sure which layer is organic and which one is aqueous, take a small sample of both layers and add some water, which layer did increase in volume? Most common organic solvents possess a lower density than water. However, halogenated solvents like dichloromethane, chloroform or carbon tetrachloride are significantly heavier than water (or most diluted aqueous solutions).

8. Filtering Flask



- Used for filtering samples because the vacuum forces the filtrate into the flask, while residue remains on the filter paper in the funnel. The funnel used for filtration is called a Buchner funnel. This funnel and a stopper can both be used to maintain the vacuum in the flask; a trap is used to prevent water from the aspirator from entering the flask and contaminating the filtrate.

9. Distilling flask

- Is used to *separate liquid mixtures* by distillation. Distillation is the process of separating mixtures based on the difference in boiling points of the components of that mixture.
- As the flask and the contents are heated, each component of the mixture changes from the liquid phase to the gas phase (components change in order from lowest boiling point to highest boiling point).
- As the molecules in the gas phase rise, they are usually routed through the sidearm into a condenser (the top of the neck is usually sealed with a cork or rubber stopper).

10. Florence flask

- It is used as a container to hold liquids. A Florence flask has a round body, a single long neck, and often a flat bottom. It is designed for uniform **heating**, boiling, distillation and ease of swirling; it is produced in a number of different glass thicknesses to stand different types of use.

F. Laboratory Apparatus used for Heating

1. Wire gauze

- Spreads out the heat produced by a Bunsen burner
- Can place a beaker on top

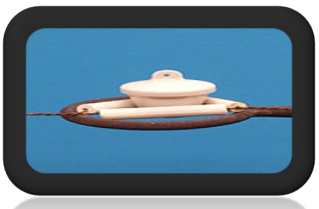
2. Test tube holder


- It holds a test tube

3. Evaporating Dish


- Holds small volumes of liquids being evaporated

4. Crucible and Lid

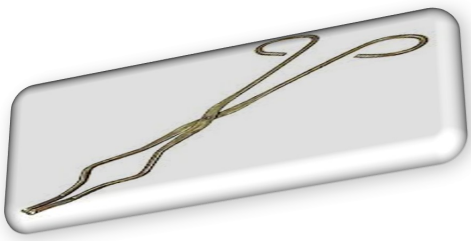



- Holds small amounts of chemicals for heating at high temperatures

5**. Clay Triangle**


- Supports a crucible in a ring stand apparatus

6. Crucible Tong




- Pick up and hold small hot items such as a crucible.

G. Laboratory Apparatus Used For Cleaning

1. Test tube brush

- Cleans out a test tube

2. Wash bottle

- Dispenses water for rinsing equipment.

H. Laboratory apparatus used for scooping

1. Spatula

- Used to transfer solids from one container to another

J. Supporting Apparatus

1. Iron Stand, Ring and Clamp

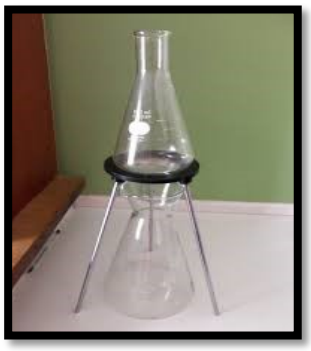


- Multi-purpose, mostly used as a support to heat chemicals and hold burets
- One side clamps to ring stand and you may place wire gauze on ring for it will hold beakers and flasks for heating. Can also hold small beakers or funnels.

2. Test tube rack

- Holds test tubes in a vertical position.
- Allows for clear sight.
- Acts as a drying rack

3. Tripod



- A laboratory tripod is a piece of three-legged equipment commonly used to conduct experiments in laboratories.
- It is used as a platform to hold and support glassware, such as beakers and flasks, during experiments and when the glassware is not in use.

To obtain the maximum performance from laboratory glassware, correct handling is essential. The following information is a guide on the safe handling of glassware and tips on how you can optimize its performance and life span.

General Precautions

It is recommended that all glassware is washed before it is first used.

Before using any piece of glassware, always take time to examine it carefully and ensure that it is in good condition. Do not use any glassware that is scratched, chipped, cracked or etched. Defects like these can seriously weaken the mechanical strength of the glass and cause it to break in use.

Dispose of broken or defective glassware safely. Use a purpose-designed disposal bin that is puncture resistant and clearly labelled. Pyrex® glassware (or any other borosilicate glass) should under no circumstances be disposed of in a domestic glass recycling stream (e.g. bottle banks), as its high melting point makes it incompatible with other glass (soda-lime glass) for recycling. The correct method of disposal is to include it in the general waste in accordance with the relevant guidelines, provided that the glass is free from any harmful chemical contamination.

Never use excessive force to fit rubber stopper into the neck of a piece of glassware. Always ensure that you select the correct size of stopper.

Many Pyrex® or Quickfit® glass products are supplied with durable, easy to use plastic screw thread tubing connectors to allow the safe fitting of any flexible tubing. When attaching tubing, ensure that the screw thread connector is removed from the glassware, the tubing is lubricated and protective gloves are worn. Never use excessive force to connect the rubber hose or tubing.

Carrying or lifting large glass flasks, beakers or bottles, etc. by the neck or rim can be very dangerous. Always provide support from the base and sides.

When stirring solutions in glass vessels, avoid using stirring rods with sharp ends which can scratch the glassware causing it to become weakened.

Heating and Cooling

The maximum recommended working temperature for Pyrex® and Quickfit® glassware is 500°C (for short periods only). However, once the temperature exceeds 150°C extra care must be taken to ensure that the heating and then cooling of the glassware is achieved in a slow and uniform manner.
Always heat glassware gently and gradually to avoid sudden temperature changes which may cause the glass to break due to thermal shock. Similarly, allow hot glassware to cool gradually and in a location away from cold draughts.
If you are using a hotplate, ensure that the top plate is larger than the base of the vessel to be heated. If the base of the vessel overhangs the hotplate top, hotspots can occur causing the base of the vessel to break. Also, never put cold glassware onto a pre-heated hotplate. Always warm up the glassware from ambient temperature.
If you are using a Bunsen burner, employ a soft flame and use a wire gauze with a ceramic centre to diffuse the flame. Never apply direct localized heat to a piece of glassware.
Pyrex® borosilicate glass is microwave safe. However, as with any microwave vessel, ensure that it holds microwave absorbing material, before placing it in the oven. Many Pyrex® and Quickfit® products utilize plastics screwcaps and connectors. These components are typically manufactured from polypropylene or PTFE, both of which are also microwave safe.
When autoclaving containers e.g. bottles with screwcaps, always loosen off the caps. Autoclaving glassware with a tightly screwed cap can result in pressure differences which will cause the container to break.

Volumetric Glassware

Always ensure that volumetric glassware is kept scrupulously clean. Dirt, and especially grease, can distort the shape of the meniscus and can also cause droplets of liquid to adhere to the vessel walls. Both seriously impair accuracy. (Good cleanliness is indicated by uniform wetting of the glass surface with distilled water).
Never pipette by mouth. Always use a purpose designed pipette filler.
Autoclaving at 121°C and cleaning glassware in an automatic dishwasher will not affect the accuracy of Pyrex® or MBL® volumetric products.
All items should be held in a vertical position when reading the meniscus. The meniscus should be at eye level to avoid parallax errors.
If using strong corrosive acids, etc. select volumetric products manufactured from chemically resistant Pyrex® borosilicate glass.
Never expose volumetric glassware to direct heat e.g. hotplates and Bunsen flames, as this will affect the accuracy.

PERSONAL SAFETY

1. Use tongs or asbestos gloves to remove all glassware from heat. Hot glass can cause severe burns.

2. Protective gloves, safety shoes, aprons, and goggles should be worn as safety chemical accidents, spilling or splattering.

3. Always flush the outside of acid bottle with water before opening. Do not put the stopper on the counter top where someone else may come in contact with acid residue.

4. Special care is needed when dealing with mercury. Even a small amount of mercury in the bottom of a drawer can poison the room atmosphere. Mercury toxicity is cumulative and the element's ability to amalgamate with a number of metals is well known. After an accident involving mercury, the area should be cleaned carefully until there are no globules remaining. All mercury containers should be kept well stoppered.

5. Never drink from a beaker. A beaker left specifically for drinking is a menace to the laboratory. Do not taste chemicals for identification. Smell chemicals only when necessary and by waiting a small amount of vapour towards the nose.

6. Avoid pipetting by mouth, particularly when using concentrated acids, alkalis or potentially bio hazardous materials. Use mechanical means such as a rubber bulb or an automatic.

10. Spattering from acids, caustic materials and strong oxidizing solutions on the skin or clothing should be washed off immediately with large quantities of water.

11. When working with chlorine, hydrogen sulphide, carbon monoxide, hydrogen cyanide and other very toxic substances, always use a protective mask or perform these experiments under a fume hood on a well-ventilated area.

12. In working with volatile materials, remember that heat causes expansion and confinement of expansion results in explosion. Remember also that danger exists even though external heat is not applied.

13. Perchloric acid is especially dangerous because it explodes on contact with organic materials. Do not use perchloric acid around wooden benches or tables. Keep perchloric acid, wear protective clothing.

14. When using hot plates and other electrical equipments, ensure the wire and plugs are in good condition. Never handle Electrical connection with damp hands.

CLEANING

- Successful experimental results can only be achieved by using a clean apparatus. In all instances laboratory glassware must be physically clean, in nearly all cases it must be chemically clean and in specific cases it must be bacteriologically clean or sterile.
- There must be no trace of grease and the safest criteria of cleanliness is the uniform wetting of the glass surface by distilled water-this be in the utmost importance for glassware used for volumetric methods.
- Any prevention of uniform wetting of the surface will introduce errors such as distortion of the meniscus and accuracy of volume.

GENERAL CLEANING

1. Cleaning of glassware which has contained hazardous materials must be solely undertaken by experienced personal.
2. Most new glassware is slightly alkaline in reaction. For precision chemical tests, new glassware should be soaked several hours in acid water (1 % solution hydrochloric acid or nitric acid) before washing.
3. Glassware which is contaminated with blood clots, culture media, etc. must be sterilized before cleaning.
4. If glassware become in duly clouded or dirty or contains coagulated organic matter, it must be cleaned with chromic acid cleaning solution. The dichromate should be handle with extreme care because it is a powerful corrosive
5. Wash glassware as quickly as possible after use but if delays are unavoidable, the articles should be allowed to soak in water.
6. Grease is removed by weak sodium carbonate solution or acetone or fat solvents. Never contamination on the glassware.
7. Special type of precipitate material may require removal with nitric acid, aqua regia or fuming sulphuric acid. These are very corrosive substances and should be used only when required.
8. It is imperative that all soap detergents and other cleaning fluids be removed from glassware before use. This is especially important with the detergents, slight traces of which will interfere with serologic and culture reactions. After cleaning, thoroughly rinse with tap water ensuring that containers are partly filled with water, shaken and emptied several times. Finally rinse with deionized or distilled water.
9. Drying can be undertaken either in baskets or on pages in air or at a temperature not exceeding 120°C.
10. Always protect clean glassware from dust by use of temporary closures or by placing in a dust free cabinet.

1. HOT PLATE

OPERATION/ MAINTENANCE /PRECAUTIONARY MEASURES

IMPORTANT SAFETY INSTRUCTIONS:

WARNING!

- Do not heat any substances above temperature which will cause hazards of explosion, implosion or release of toxic or flammable gases from the material being heated.
- Do not use in the presence of flammable or combustible materials, or explosive gases.
- Do not use in the presence of pressurized or sealed containers. Fire or explosion may result causing injury or death.
- To avoid electric shock, always use a property grounded electrical outlet of correct voltage, and correct handling capacity equipment
- The user shall be aware that, if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- The instrument should be placed so, that handy operation of the ON-OFF Switch is possible. Service only by a qualified Service engineer.
- Always disconnect from power supply prior to maintenance and servicing.
- The instrument may be hot to touch, even when the pilot light is off.
- Connect the instrument to a ground mains outlet, after ensuring that the Voltage is the same as given on the name plate
- The Instrument must be connected to an earthen (grounded) supply.

OPERATION

Please read the following carefully before use:

- Do not use this product in a manner other than as stated in the Operating Conditions section of this manual as the protection provided by the equipment may be impaired.
- The plate temperature might remain dangerously high even after the heater was turned off.
- Don't touch the plate and/or place any objects on top of it that are not meant to be heated.
- This product is designed for use in laboratory environments by persons knowledgeable in safe laboratory practices.
- Always wear safety glasses and other appropriate protective equipment when operating this product.

- The plate might be covered with aluminum foil to protect it, **DO NOT cover any other part of the device and make sure that the radiation sheets underneath are untouched.**
- The Aluminum topped plates are not designed to be used with metal containers. For heating of such containers it's advisable to use a ceramic top hot plate.
- Connect only to grounded power source, make sure the voltage and frequency of your electrical outlet fits the requirements labeled on the device.
- Do not use in areas with explosive atmosphere, flammable/combustible liquids etc.
- Do not overweight the plate.
- Before cleaning the device, make sure to disconnect it from the power source.
- Do not immerse the product in any liquid.
- Position the product for use so that the power cord can be easily disconnected without having to move the product.

Heating Operation Principles

- The heating element and a temperature sensor are located just beneath the top surface of the product. The microprocessor is responsible for regulating the heating produced by the heating element right beneath the plate surface.
- The microprocessor work is based upon the sensor temperature and the value set on the Heating Temperature Display.
- When the sensor temperature is not within range of the value set on the display, the display will FLASH. When the sensor temperature is within range, the value displayed will remain constantly ON.
- The Heating Temperature Display does not indicate the actual temperature of materials placed on top of the product or the actual temperature of the top surface.

Cleaning:

- To keep the plate clean you can use aluminum paper you can cover the hot plate only **but not the cooling plates under it.**
- No use of caustic soda in cleaning reagent.

2. ELECTRONIC KITCHEN SCALE

OPERATION/MAINTENANCE/PRECAUTIONARY MEASURES

Setting Up:

- Remove the electronic scale from the packaging.
- Open the battery cover, insert three (3) AAA batteries into the battery case, and close it.
- Set the scale on a flat, steady surface.

Weighing:

- Press the [ON/OFF/TARE] button to turn the scale on. The display will show zero “0” after 2 seconds.
- Place the food container that will be holding your food onto the scale. The LCD will show the weight of container.
- Press the [TARE] button, and the LCD will reset and display zero (0).
- Remove the container, add food into the container, and return the container onto the scale.
- Read the weight of the food. The TARE function subtracted the weight of the container and now shows the weight of only the food.

Shutting Off

- Press the **[ON/OFF]** button to turn off the scale

Error Display

Screen Message	Meaning
LO	Low batteries; change immediately
EEEEE	Overloaded scales; Too much weight

Battery / Effective Function

To ensure the scale functions properly, make sure you:

- Use 3 × AAA batteries
- Have fully charged batteries
- Insert the batteries with the + and – position correctly

Advice for Proper Results, Care, and Maintenance

- Use the scale on a clean and flat surface.
- Do not weigh heavy items. The max. weight is 5000 g (before tare).
- This scale is for small goods and personal use. Do not use for legal trade.
- Do not put the scale under water or use in hot or cold conditions.
- Clean with a soft cloth. Do not use any chemical detergents or allow water to get inside.
- This product is a high-precision electronic weighing apparatus. Please do not press or drop the scale, otherwise damage may easily occur.
- If the result appears incorrect, please check the battery installation or replace the batteries.

3. pH METER

OPERATION / MAINTENANCE / PRECAUTIONARY MEASURES

OPERATION

- Load/check the battery.
- Prepare the electrode. Carefully handle it because it is most sensitive part of the pH meter.
- Calibrate the standard solutions. pH measurement means requires daily calibration of the instrument against set standards to even out effects of temperature.
- 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 the test solution into a beaker. Take the temperature of the solution. It should be the same of 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 pH solution, repeat it for 3^{rd} 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 the container in a cool dry place.

Storing and maintaining the pH meter

- After the measurement, switch off the pH meter.
- Using a wash bottle, wash 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 a pure water for a few hours or in 0.1 M hydrochloric acid for about 30 minutes. Then rinse with pure water before using. Care must be taken not to let the liquid junction part be soaked with the water or hydrochloric acid.
- If the electrode membrane gets contaminated and can be remove with pure water, clean it using gauze or other soft materials moistened with dilute soap solution, or dip it into solution of about 0.1 N 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 cleansing solution.
- Replenish the inner solution when the temperature of the inner solution is the same as that of the

4. SPECTROPHOTOMETER

OPERATION/MAINTENANCE/PRECAUTIONARY MEASURES

OPERATION:

The operation before measure

- Open the power switch to preheat it for 15 minutes to make the equipment stabilized. Now the screen displays (T XX.X).
- Spin the wavelength knob to make its selected wavelength-line be in alignment with the indicatory line.
- Put the preparation Reference sample into the cuvette.
- Open the sample cover, inserting the reference sample and bold into the plug jack of the sample frame. And close the sample cover.
- Pull the draw rod so that the reference sample is in the position of measurement. Press the button <100%T>, the screen displays (100.0).
- Pull the draw rod so that the bold is in the position of measurement. Press button <%T>, the screen displays (0.000).
- Pull the draw rod again so that the reference sample is in the position of measurement. If it doesn't displays (100.0), then press button <100%T> again to displays (100.0).
- Open the sample cover and take out the reference sample and bold.

Measurement

Transmittance Measurement

- Add the tested-sample into the cuvette. Insert them into the sample frame (The sample frame has four jack, which can take four cuvette), then close the sample cover. Now the sreen shows the value that is the measurement results. Pulling draw rod can make a continuous measurement of four samples.

Absorbance Measurement

- Press button <Mode>, the screen displays (A 0.XXX), the rest operation is same as the 3.2.1. The screen shows the absorbance of the sample.

Concentration measurement that calibrated by standard sample.

- Press button <Mode>, the screen displays (C XXXX). Put the standard sample into the cuvette, and insert them into the sample frame. Then close the sample cover. Press button < > and < > to input the concentration of the standard sample. Then press <Confirm>. Now the screen displays (F XXXX), the value of it is the factor that calculated by the standard sample.
- Press button <Mode> 3 times, the screen displays (C XXXX). Open the sample cover and take out the standard sample. The rest operation is same as the 3.2.1. The screen shows concentration of the sample.

Concentration measurement of known calculation factor

- Press the button <Mode>, the screen displays (F XXXX). Press button ( ) and ( ) to input the known factor. Then press (Confirm). Now the screen displays (C XXXX). The rest operation is same as the 3.2.1. The value of the displays is the concentration of the sample.

MAINTENANCE

- In order to ensure stability of the equipment in the working process, it is recommended that users exchange regulated power supply in the condition which has the fierce power supply voltage fluctuations.
- When the machines stop working, we should turn off the power switch, cutting off power supply.
- Every time after it is used, the samples room should be carefully examined whether there is any solutions overflow. They must be absorbed with filter paper.
- Use dustproof to hood the equipment and put moisture proof agent in it when you stop working, so as to avoid fouling apparatus, and damp stains.
- Cut off power and unplug the power cord before you clean the equipment.
- Do not use organic solvents but wet soft cloth to wipe the apparatus shell.
- Check the cooling holes on the back of the equipment and fans (752) regularly to maintain patency.
- Tungsten halogen lamps have a life. After a long period of usage, it will darken, burning. Then it must be replaced.

Replacement of Tungsten Halogen

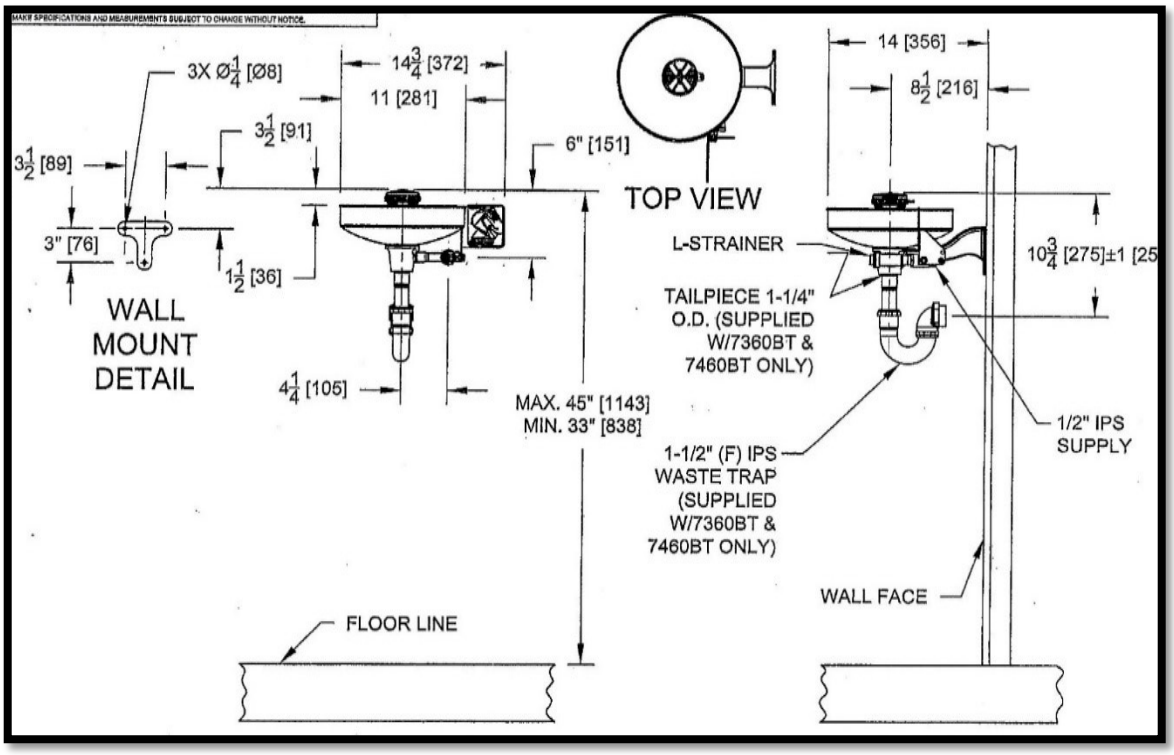
- Turn off the power of the equipment.
- Removed the cooling plate on the back plate of the equipment.
- Unscrew the fixed screw of the lamp part, lift and get it outside.
- Unplug the lamp holders from the lamp bar and plug in the new one.
- Put the new lamp on the fixed screw, do not tighten it temporarily.
- Open the power.
- Move the lamp until it forms an image on the slit. At meanwhile observe the display reading the largest number, and then screw the fixed screw.
- Equip with cooling plate.

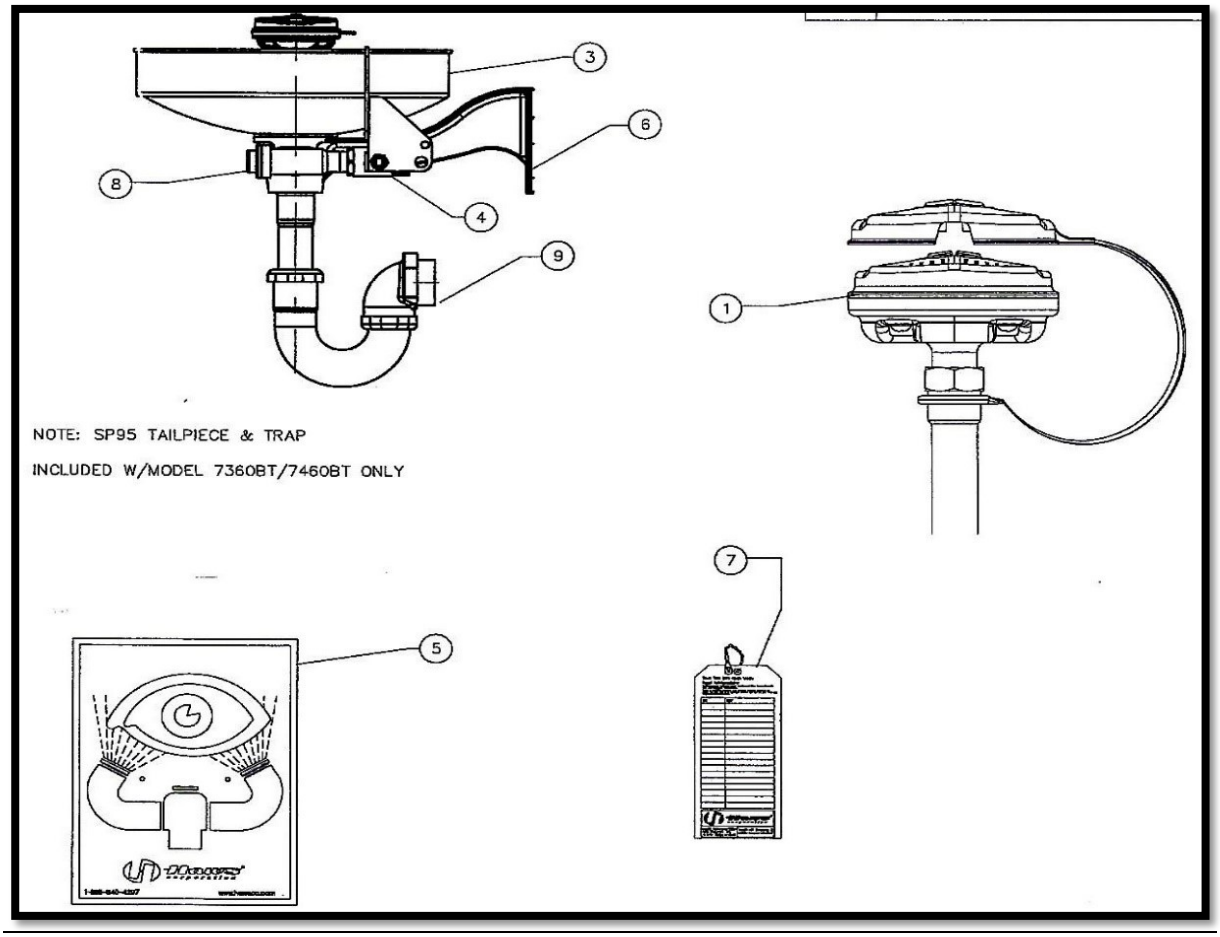
NOTE: Do not touch the glass-surface of the lamp when replaced. It is recommended to wear cotton gloves to operate. It must be cleaned by anhydrous ether if you touch it in deliberately. Before you open the power you should use a hair dryer to dry the lamp, or it will be left stains unable to remove.

Analysis and Treatment of Common Faults

Phenomena	Cause	Treatment
1.No screen display, tungsten halogen lamps are not bright: (only 752) the fans on the back panel do not run	1. Equipment did not plug the power cord tight 2. Power outlet w/out electricity 3. power cord is damaged 4. Fuse is damaged 5. the switch is damaged	1. Check the power cord plug 2. check the outside power supply 3. Replace power line 4. replace fuse 5. Contact with the factory maintenance personnel 6. Contact with the factory maintenance personnel
2.Startup screen is displayed but tungsten halogen lamps are not bright	1.The lamps are damaged 2. Lamp holder is damaged 3. Power supply circuit of light is damaged	1.Contact factory to buy lamp parts 2. contact factory to buy lamp holder 3. Contact with factory maintenance personnel
3. (only 752) Display readings 0 when the wavelength adjust below 370nm, and it had readings when adjust above 370nm.	1. Deuterium lamps are damaged 2. Deuterium lamps power is damaged	1. Contact the factory maintenance personnel. 2. Contact with the factory maintenance personnel
=4.When press button <100% T>, the display shows (LO)	1. Sample frame has shade structures inside (such as bold) 2. Sample frame did not pill in place 3. The lights dim 4. Circuit fault 5. Optical fault 6. The wrong color plate is use (only 752)	1. Remove the shade structures 2. Pull sample frame in place 3. Contact with the factory maintenance personnel 4. Contact with the factory maintenance personnel 5. Contact with the factory maintenance personnel 6. Use quarts plate colorimetric below 370nm
5.Data showed instability during measurement process	1. Sample frame did not pull in place 2. Sample frame of turbidity 3. Colorimetric plate is dirty 4. Sample is too thick 5. The lights dim 6. Circuit fault 7. Optical fault	1. Pull the sample frame in place 2. Concoct new sample 3. Wash colorimetric plate and clean its surface 4. Dilute sample 5. Contact witty the factory maintenance personnel 6. Contact witty the factory maintenance personnel 7. Contact witty the factory maintenance personnel

5. EYE WASH


MAKE SPECIFICATIONS AND MEASUREMENTS SUBJECT TO CHANGE WITHOUT NOTICE.
3X Ø1/4 [Ø8]
14 3/4 [372]
11 [281]
3 1/2 [91]
3 1/2 [89]
6" [151]
TOP VIEW
14 [356]
8 1/2 [216]
3" [76]
1 1/2 [36]
WALL MOUNT DETAIL
4 1/4 [105]
MAX. 45" [1143]
MIN. 33" [838]
L-STRAINER
10 3/4 [275]±1 [25
TAILPIECE 1-1/4" O.D. (SUPPLIED W/7360BT & 7460BT ONLY)
1/2" IPS SUPPLY
1-1/2" (F) IPS WASTE TRAP (SUPPLIED W/7360BT & 7460BT ONLY)
WALL FACE
FLOOR LINE


3
6
8
4
9
1
NOTE: SP95 TAILPIECE & TRAP
INCLUDED W/MODEL 7360BT/7460BT ONLY
7
5

ITEM	DESCRIPTION
1	SP65 Eye/Face Wash Valve Assembly
2	--
3	SP90 Bowl
4	SP232 Valve Assembly
5	SP175 Eyewash Sign
6	SP80 Bracket
7	SP170 Test Tag
8	SP509 L-Strainer
9	SP95 Tailpiece &Trap

OPERATION /MAINTENANCE/PRECAUTIONARY MEASURE

Employee Instruction

- To insure adequate operation of the units, all persons should be instructed in the proper use of both the shower and the eyewash. Affected areas should be rinsed at the scene of the accident for at least 15 minutes, and a doctor or industrial nurse should be contacted immediately.

WARNING: eye/ eye-face wash fountains should not be used if it is known that eye contamination is metal or some other rigid solid fragment. In such an event both the victim's eyes should be gently immobilized in accordance with the current "Red cross standard First Aid Manual" and medical attention immediately sought.

IDENTIFICATION AND SIGNAGE

- Units should be installed in close proximity to hazardous areas, free from obstructions that may inhibit immediate use, and clearly identified as eyewash stations or emergency showers or bath.

How to Use an Eyewash

INSTALLATION AND WATER SUPPLY

- Showers and eyewashes should be connected to the main potable water supply, and a loose-key lock-shield type stop or shut-off valve is recommended to allow proper maintenance of the unit.
- Valve must be labelled to prevent unauthorized shut-off.
- One of the most important considerations when installing water bearing emergency equipment is assuring an adequate supply of water available to unit. Piping should be installed no smaller than the inlet size of the unit, and at least 30 psi dynamic pressure should be available to the equipment. The ideal pressure for shower eyewash is between 40 to 60 psi.
- Only products that meet the American National Standards Institute for Emergency eyewash and Shower Equipment should be installed.
- Emergency Eyewash, shower, drench hose, and combination units are not a substitute for proper primary protective devices. As a defense against flying solid particles and splashing injuries liquids, workers should wear eye and face protectors and protective clothing.

PROPER DRAINAGE

- Appropriate drainage should be considered for emergency showers and other equipment to prevent excess accumulation of water on floors.

FREEZE-RESISTANCE

- When installation are outside and temperatures drop below 32^{o}F, freeze-proof units are recommended.
- Precautions should also be taken to protect the user under frigid conditions.
- It shall be the responsibility of each specifying authority to determine the delivered temperature that will be required in the area, not only to provide the flow of water required, but also maintain it at a temperature that will be safe for the user.
- Delivered water temperature should not be extremes that might be expected to discourage the unit's effective use under emergency conditions. A comfortable range is 15^{o}C -38 ^{o}F (60 ^{o}C-100 ^{o}F).
- In circumstances where chemical reaction is accelerated by water temperature, a medical advisor should be consulted for the optimum temperature for each application.

WARNING ALARM SYSTEMS

- In remote areas or in hazardous locations where there are very few people, a Haw Model 9001 alarm should be installed. This alarm activates when the shower or an eyewash unit is used in order to summon help to the injured.

PROTECTION FROM DEBRIS

- Wherever possible, a Haws Model 9070 filters should be provided upstream of the eyewash to remove particles from the water and prevent additional eye damage. Model SP502 strainer tee is also available.
- Line size- Y strainer installed in supply line to unit should be considered to reduce chance of debris reaching eyewash and /or shower.
- When protection of a Haws eyewash from dust or airborne contaminants is necessary, Haws offers 9102 dust Cover which encloses the bowl and is available for selected eyewash models.

SPECIFIC REQUIREMENTS

- These units should be located as close to the hazard as possible without physically causing a hazard itself such as protruding fittings. Emergency showers and eyewashes shall be accessible locations that require no more than 0 seconds to reach.
- However, the maximum time required to reach the shower or eyewash should be determined by the potential effect of the chemical. For example, exposure to a highly corrosive chemical might require showers to be installed within 3 to 6 meters (10 feet) from the hazard.
- It is recommended that the consulting physician be contacted for the advice on the proper distances. Per ANSI Z358. 1-2009, tepid water should be used to protect the user under rigid conditions, including provisions for the proper disposal of the water.
- Installation procedures should be in accordance with the proper plumbing practices, with the supply piping sized adequately to meet flow requirements.
- Supply lines should be properly flushed prior to installation of emergency units.

6. LIGHT MICROSCOPE

OPERATION/ MAINTENANCE/PRRECAUTIONARY MEASURES

Main Features

- WPN Digital biological microscope has all performances of ordinary biological microscopes, built-in CCD imaging system, USB, Video and S Video prot. By working with computer image analysis software and application technology of computer multimedia, it provided with the numerical manifestation of various choice on video of digital observation, also you can conduct the still image capture, dynamic video recording, target measurement.

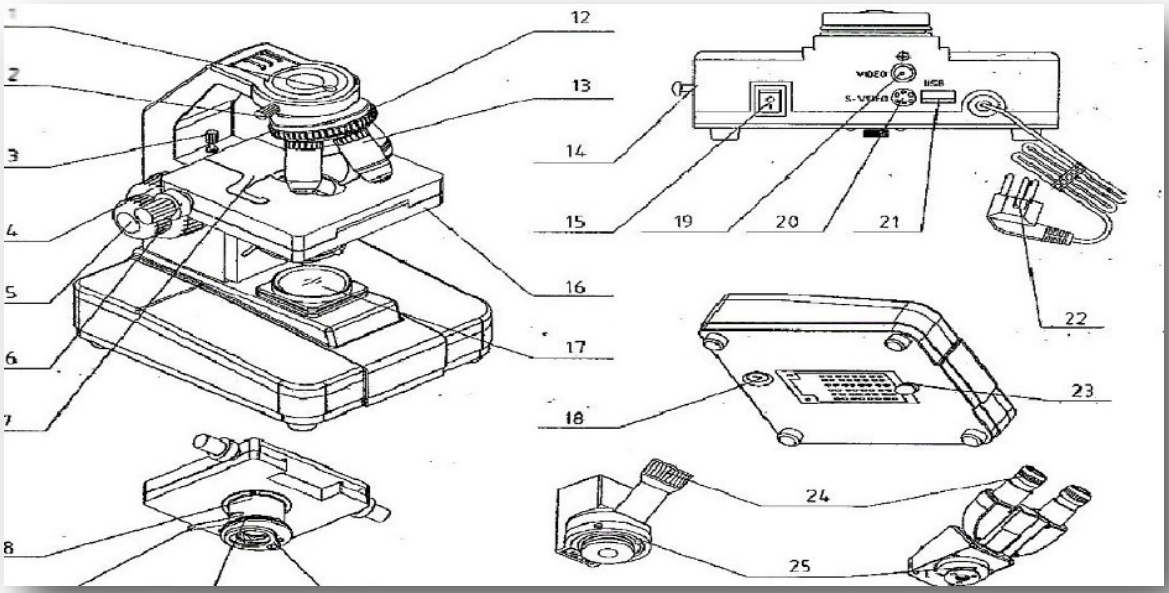
Usage and Coverage Area

- WPN is an ideal instrument for use in clinic and hospital laboratory, lab, research institution, university in the research of biology, pathology, bacteriology, higher mathematics, and educational laboratory sessions.

Working Circumstance of Microscope

- This microscope is a precise and optical instrument, If the usage or safekeeping isn't appropriate, will cause the instrument damage or as to it's the accuracy invalidate. While choosing to use the place, please consider the following condition:
- The place for this microscope should not be too bright, and direct sun shine on the instrument should be avoided.
- The working temperature: 0°C--40°C. The maximum relative humidity: 85%, the heat and humidity can stimulate the growth of mildew, which will cause the damage to microscopes and shorten its using life.

Structure and Nomenclature



1. Oriented Opening: It fix ups the viewing head with the dowel pin.
2. Setscrew: Fix up projector.
3. Orientation bolt: Restrict the highness of flat form.
4. Coarse focusing knob: Large focusing
5. Fine focusing knob: Large focusing.
6. Flat form hand wheel: Adjust the flat form move for transverse and lengthways.
7. Slide clip: Clip specimen.
8. Condenser: Collect the illuminating ray.
9. Condenser moving staff: Adjust the height of condenser.
10. Condenser diaphragm: Adjust size of condenser diaphragm.
11. Filter rack Placement the filter.
12. Revolving nosepiece: Used to select objectives needed (locate with sound).
13. Objective: Magnify specimen for the first time.
14. Brightness adjuster: Adjust the brightness of lamp house.
15. Power switch.
16. Mechanical stage: lay specimen
17. Illumination: provide: the lamp-house.
18. Fuse: Fix up fuse.
19. Video: Video signal output
20. S-Video: Super video signal output (ask for specialties).
21. USB port: Digital signal output.
22. Power port: Connect power supply, video/S-Video signal output.
23. Lamp holder board: install the lamp.
24. Dioptre adjuster Eyepiece: adjust Dioptre adjuster of eyepiece.
25. Dowel pin: Insert the orientation opening to fix up the viewing head.

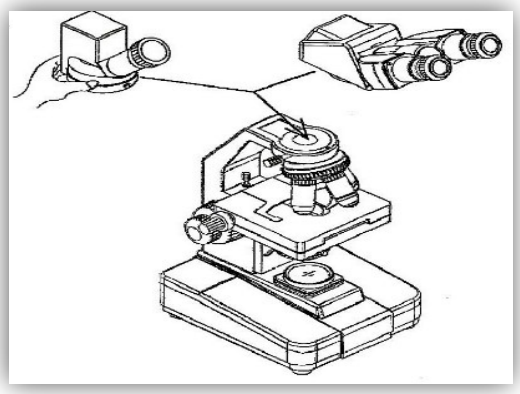
Technical Specification

Main specification	Total magnification: 40-1600X			
	Mechanical tube length	160mm		
	Objective Conjugate distance	195mm		
Viewing head	mono	Inclined viewing: 45°		
	Hinge type bino	Inclined viewing: 30 ° pupil distance: 55-75mm		
Eyepiece	Wide Field	WF10X, F.N. 18mm		Adaptor: mono: 23.2mm F.N.: 18mm Bino: 30mm, F.N. 18mm or 20mm Parfocal distance: 10cm
		WF10X, reticle, F.N. 18mm		
Objective	Magnification	Numerical Aperture	Par-focal Distance	Remarks
	100X(S) oil	1.25	45mm	
	63X (S)	0.85	45mm	Optional
	40X(s)	0.65	45mm	
	25X(S)	0.40	45mm	Optional
	10X	0.25	45mm	
	4X	0.10	45mm	
	Adapting size: WJ 4/5" X 1/36"			
Condenser	Abbe consender	N.A. 1.25, iris diaphragm		
Digital signal	Resolution: 480 TVL			
	PAL system: NTSC system	0.47 mega pixel 0.41 mega pixel		
	S/N ratio	52-60 dB		
	USB frame rate	30 fps		
	Signal out	USB, Video, S-Video		

Instrument's Installation

a. Place the microscope on the flat and stable working table, while moving the instrument, especially the optical parts, make sure to avoid to contact the lenses surface with hand or artic with grease.

b. The viewing head is lightly installed aim at the orientation fenestra 1, one hand pressing the top of viewing head, and other hand tightening the setscrew (2). Make sure the digital head is secure and not loose.



c. Simulant signal demonstration

d. Using Video out, please insert Video cords into "Video" socket (19) at the back of microscope and "Video in" on the TV. Set the TV/Av on TV into "AV', to show the signal.

e Using S-video, please insert S-Video (20) into corresponding hole on TV, and set it into TV/Av status, then it will reverted into S-Video (instead of Video out).

f. Digital signal demonstration

Working with PC: make use of supplied USB line and connect the microscope (USB port) with PC. For detailed software installation please refer to the "User's manual for PHMIAS 2000

g. Turn on the power: after all above procedures, please insert the power plug on the wall outlet, make sure you are using the right voltage.

h. Insert the Eyepiece: slide the eyepiece into the eyepiece tube.

Operation Procedure

1. Turn on the power

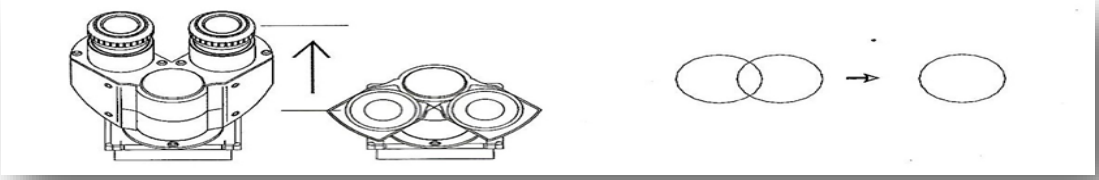
- Turn the power switch (15) (turn switch to "– "make the bulb give out light.
- Then revolve the hand wheel (14) of brightness regulates to regulate the brightness of filed.

2. Restoration to adjust diopter of tube

- To adjust dioptre of tube on the R/L eyepiece tube, Make its bottom edge with engrave the line to align, use the same method, adjust the left dioptre.

3. Adjusting pupil distance

- By adjusting pupil distance and dioptre ring on eyepiece, to eliminate the Parallax, and to get the sharp and comfortable viewing. While using bino head and field of view is two intersectant circles, by rotating the eyepiece tube, the eye Relief has been changed, the field of view became a round view completely coincided.

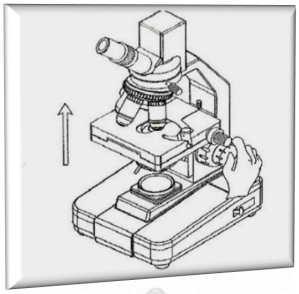


4. Mounting on the specimen

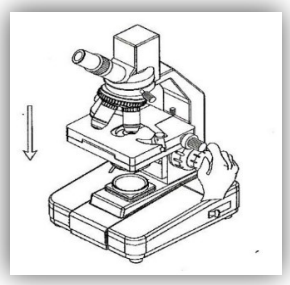
- Turn apart the Specimen Clips (7), put into the specimen, and use slide clip to hold it. Release the fingers; make sure that the viewing area right in the middle of stage

5. Using 10X objective focusing.

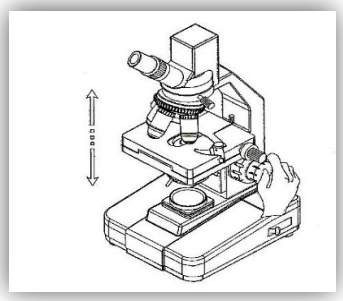
- By rotating the Revolving nose piece (12), make sure that lower magnification objectives (4X or 10X) are in the optical center, and get a wide field of view.
- Rotating Coarse Focusing wheel (4), moving the stage (6) to the tiptop.



- Adjust fine focusing knob to find sharp image. Adjust the dioptre eyepiece (24) until the image is clear.

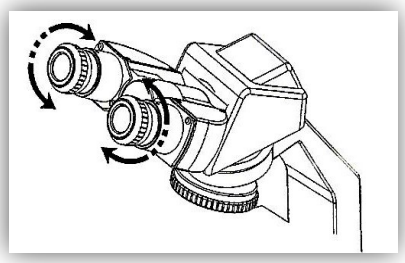


6. Adjust fine focusing knob (5) to find clear image.

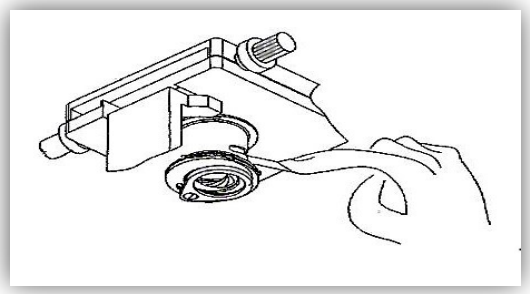


7. Adjusting Dioptre

- According to the parallax of the left and right eye to adjust dioptre of tube on the eyepiece tube (24) This function that adjust can let user make the best of the excellence object lens. The clear image that makes a pair of eyes to observe is consistent.



8. Rotating the condenser moving staff (9), make condenser move high-est. and a little lower. If you observe dispersion image in view field, please adjust condenser.



- Rotating Revolving nosepiece, choose magnification that you need.
- Adjust the viewing head setscrew, in order to objective easy.
- Start-up micro image software, carrying on the observation of the specimen image edits catching.
- If objective selected is 100X oil (spring), use oil as observing medium.
- Then move the specimen into the view filed and rotate the nosepiece to view field.

- Then move the specimen into the view filed and rotate the nosepiece to view field.
- Extrude a little oil from oil bottle. Dip oil onto the pot to observe.
- Then move the specimen into the view filed and rotate the nosepiece to view filed.
- The inter space between top objective and cover glass must be full of oil. Only the observation be done.
- When the microscope is needn't, first turn off the micro graph software, where after, turn off the switch.

Care and Maintenance

1. `The power switch (15) at the back side of base in main power control. If the microscope is no longer in use, please switch off the power to avoid the electron elements in working status. If the microscope will not be used for a long period, please unplug the power wire from socket. Also keep various accessories in safe places.

2. Using learning gauze (or silk, observant cotton) soaked with some ethanol to clean the microscope body. After cleaning, cover it with dust cover.

3. Cleaning the Lenses: Use blower or soft cloth to wipe the surface dust. The contaminated dust, finger prints can be wiped off by lens paper or soft cloth soaked with blending (20-30 % alcohol – 70-80% ether).

4. Cleaning the microscope surface: Clean with soft cloth, for severe stain, please clean with neutral detergent.

5. Microscope Storage: If the microscope will not be used for quite a long period of time, please turn of the power, cool down the light bulb, mask it with dust cover and then put it back into packaging case. Store it in a cool, dry, clean place free from acid or alkali steam. As this will cause mildew on the lenses.

6. Routine Inspection: In order to maintain the performance of microscope, please conduct routine inspection and maintenance.

⇒ Replacing the Light Bulb and Fuse

Replacing light bulb:

- Turn off the microscope; unplug the power cord from socket and wait for 30 min, until it cools down.
- Screw off the light base, and pull out the light base board, and rotate at some angle until the light base comes out. Take out the damage bulb, and replace with a new one.
- While inserting the new bulb, please make sure to get the good contact and solid connection between light bulb and base. While taking bulb with hand, make sure to wear a glove to avoid the finger print being left on the bulb. (Fingerprint will erode the bulb surface, lower the brightness, and shorten the bulb working life).

⇒ Replace the fuse:

- Pull out the fuse compartment cover (13), take out the damage fuse, and replace the new fuse and then build in in the compartment cover.

7. COMPOUND MICROSCOPE

OPERATION AND MAINTENANCE

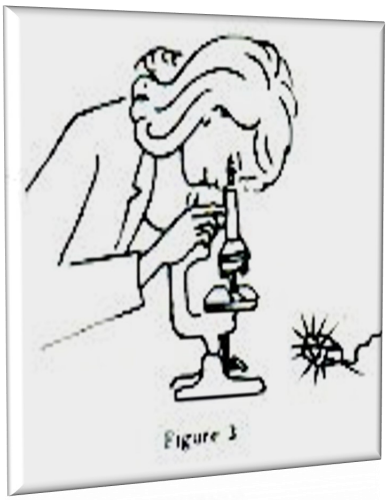
1. When moving your microscope, always carry it with both hands (Figure 1). Grasp the arm with one hand and place the other hand under the base for support.

2. Turn the revolving nosepiece so that the lowest power objective lens is "clicked" into position.

3. Place the microscope slide on the stage and fasten it with the stage clips. You can push down on the back end of the stage clip to open it.

4. Using the coarse adjustment, lower the objective lens down as far as it will go *without touching the slide!* Note: Look at the slide and lens from the side when doing this (see Figure 2).

5. Look through the eyepiece and adjust the illuminator (or mirror) and diaphragm (Figure 3) for the greatest amount of light.



6. Slowly turn the coarse adjustment so that the objective lens goes *up* (away from the slide). Continue until the image comes into focus. Use the fine adjustment, if available, for fine focusing.

7. Move the microscope slide around so that the image is in the center of the field of view and readjust the mirror, illuminator or diaphragm for the clearest image.

8. You should be able to change to the next objective lenses with only slight focusing adjustment. Use the fine adjustment, if available. If you cannot focus on your specimen, repeat steps 4 through 7 with the higher power objective lens in place. DO NOT ALLOW THE LENS TO TOUCH THE SLIDE!

9. The proper way to use a monocular microscope is to look through the eyepiece with one eye and keep the other eye open (this helps avoid eye strain). If you have to close one eye when looking into the microscope, it's ok. Remember, everything is upside down and backwards. When you move the slide to the right, the image goes to the left!

10. Do not touch the glass part of the lenses with your fingers. Use only special lens paper to clean the lenses. (read the page on keeping your microscope clean)

11. When finished, raise the tube, click the low power lens into position and remove the slide.

MAINTENANCE

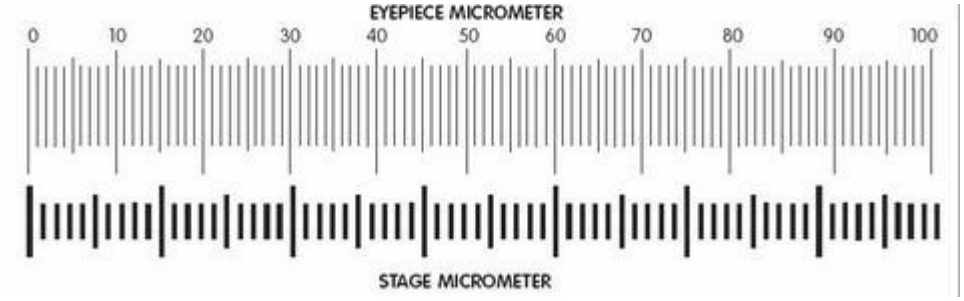
- The microscope should be placed in the wooden box after use and should be stored in a cool dry place free from acid and alkali fumes.
- The microscope has been carefully tested and checked. The objective and eyepiece should be disassembled. If there is dust, blow it off by means of a blower, and then brush it with a soft hair-brush. Oil stains can be removed by using a piece of clean soft cloth moisture with a little xylol.
- Any dust on the mechanical part of the instrument should be wiped off first and the rubbed with a clean fine cloth. Unvarnished sliding part should be applied with a thin layer noncorrosive lubricant.
- When the coarse adjustment mechanism is found too high or too loose for the elevation or lowering, hold the coarse adjustment knob with one turn another knob with the other hand loosen it when it is too tight and tighten it when it is too loose. A suitable adjustment will enable it to operate fitly.
- The objectives should be covered and replaced in a box to avoid dirt or crushing, after use.
- The 100x objective should be rubbed over with clean fine cloth moistened with xylol.

Calibrating A Microscope

Calibrating a microscope requires two things, a stage micrometer and a reticle. Your reticle should already be installed in your eyepiece. In order to calibrate your reticle follow the following procedure.

1. Switch to the lowest magnification of your microscope.

2. Place the stage micrometer onto your microscope with the 0 position on the stage micrometer in line with the 0 position of the reticle (eyepiece micromerter) as seen below:



3. Look for the first spot where the lines of the reticle and the stage micrometer match as they do at the 0 points. In the above image that would be 30. They also mach at 60 as well.

4. Count how many divisions on the stage micrometer there are that match with the 30 spot on the reticle (eyepiece micrometer). In this instance the answer is 20.

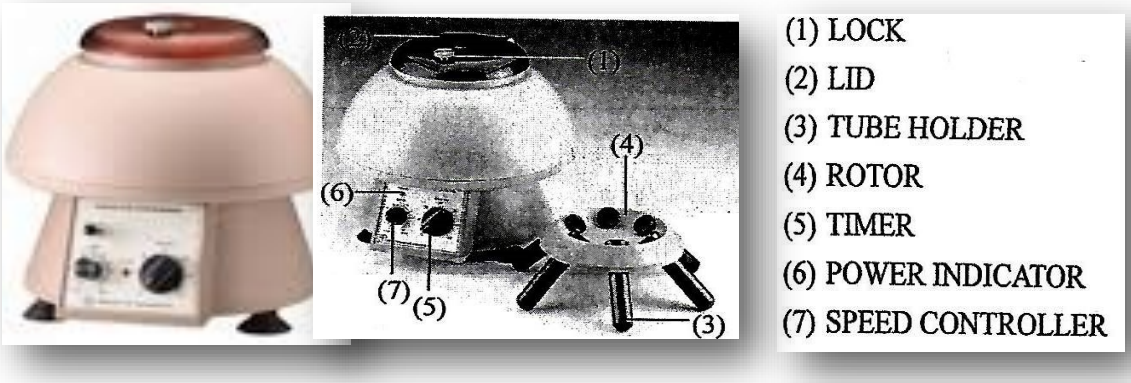
5. Since each line is 10um in width 20 of those lines equals 200um.

6. You have all your data to calculate what each division represents. 30 divisions on the reticle (eyepiece micrometer) equals 200 micrometers.

7. Next determine what one division on the reticle (eyepiece micrometer) represents by dividing 200 by 30. This tells us that each division on the reticle under the objective you have selected is 6.67um.

8. Repeat this procedure with all of the other objectives on your microscope.

8. CENTRIFUGE MACHINE



OPERATION /MAINTENANCE/PRECAUTIONARY MEASURES

OPERATION:

1. Connect with power supply.

2. Press and turn the "LOCK" (1) left or right to open the "LID" (2) of the centrifuge, then, place the tubes with specimen (each tube must be equivalent in weight) into the "TUBE HOLDER" (3), and then insert them into the "ROTOR" (4). If only one specimen is tested, you should put other empty tubes with water in equal weight together with "TUBE HOLDER" (3) into the Rotor for centrifugal.

3. Put the "LID" (2) down gently, and turn the "LOCK" (1) left or right to close the "LID" (2).

4. Turn the "TIMER" (5) over the required scale, then return the time calibration as required scale. (For instance, you need 5 minutes for centrifugal, but you need to wind to 7 or 8 minute scale at first, then return back to 5 minute scale.) Then, the "POWER INDICATOR" lights up.

5. Adjust the "SPEED COTROLLER" (7) to a required velocity scale.

6. The centrifugal time reaches to the end, then a sound "DON" to be heard.

7. After the "ROTOR" (4) stops completely, open the "LID" (2) and take out the specimen.

Remark:

During the operation, there are two methods (1) and (2) to stop the machine emergently.

1) Open the LID, and then the safety switch device will cut off the power. The machine will stop in minutes.
2) Turn the "TIMER" counter clockwise to "Zero", and then you will hear the sound "DON". The machine will stop in minutes.
3) Be noted that you can open the "LID" (2) only after the "ROTOR" (4) stops completely.

Cleaning Direction:

- Disconnect from power supply prior to clean.
- Clean the equipment after every use.
- Use a moist cleaning cloth to clean the case, rotor and tubes holders.
- Dry the equipment thoroughly before operation.
- Do not immerse the equipment in water.
- Never use benzene or paint thinner for cleaning.

9. DRYING OVEN

OPERATION / MAINTENANCE/ PRECAUTIONARY MEASURES

Installation of the Equipment

Electrical Connection

- B28, E 28:
- Shockproof plug, power supply voltage 230 V (1N-) +/-10%, 50/60Hz
- Fixed power connection cable of 1800 mm/5.9ft in length
- B 28 (115 V), E 28 (115 V):
- NEMA plug 5-15P, power supply voltage 115 V (1N-) +/-10%, 60Hz
- Fixed power connection cable of 1800 mm/5.9ft in length
- Prior to connection and start-up, check the power supply voltage. Compare the values to the specified data located on the unit's type plate (on the left-hand side of the unit).
- When connecting, please observe the regulations specified by the local electricity supply company as well as the VDE directives (for Germany)
- Pollution degree (acc. To IEC 61010-1):2
- Over-voltage category (acc. to IEC 61010-1)II

Caution
Danger of incorrect power supply voltage. Damage to the equipment Check the power supply voltage before connection and start-up. Compare the power supply voltage with the data indicated on the type plate.

To completely separate the unit from the power supply, you must disconnect the power plug. Install the unit in a way that the power plug is easily pulled in case of danger.

Start Up

⇒ Turning on the unit

- Warning chambers may release odors in the first few days after commissioning. This is not a quality defect. To reduce odors quickly we recommend heating up the chamber to its nominal temperature for one day and in a well-ventilated location.

⇒ Temperature setting

- The adjustment of the temperature level is identical for E and B. the temperature controllers only differ in the temperature range:

- Set the thermostat knob (4) to the desired temperature. Lock it by turning the thermostat brake (6). Illumination of the yellow pilot lamp (5) indicates that the heating is on. When the working temperature reach, the yellow pilot flashes indicating operation of the thermostat.

To ensure exact temperature control, always set the temperature by turning the thermostat knob (4) clockwise. Before setting any temperature, turn the thermostat knob back to the left stop.

Fresh Air Supply

- Use the ventilation slide inside the chamber on the top at the ceiling to adjust fresh air supply.
- If the ventilation slide is completely open, this may negatively influence the spatial temperature accuracy, which may decrease by up to 5%.
- The air exhaust slots on top of the housing become hot during operation. Do not cover them.

CAUTION
• Danger of overheating. • Damage to the unit. • Do NOT touch the air exhaust slots on top of the housing, the glass door (with B 28), the inner surfaces and the charging material during operation. • Do NOT cover the air exhaust slots on the top of the housing.

Using the E 28 for hot-air sterilization

- Sterilizing load: instruments, glass and glass instruments, syringes (no synthetic material or surgical cotton wool).
- Sterilizing temperature: 189°C/356 °F.
- Sterilizing Time: unless laid down by special organizations of your country, we recommend 30 minutes after reaching the sterilizing temperature. When using sterilizing boxes, the sterilizing time must be increased by another 15-30 minutes.

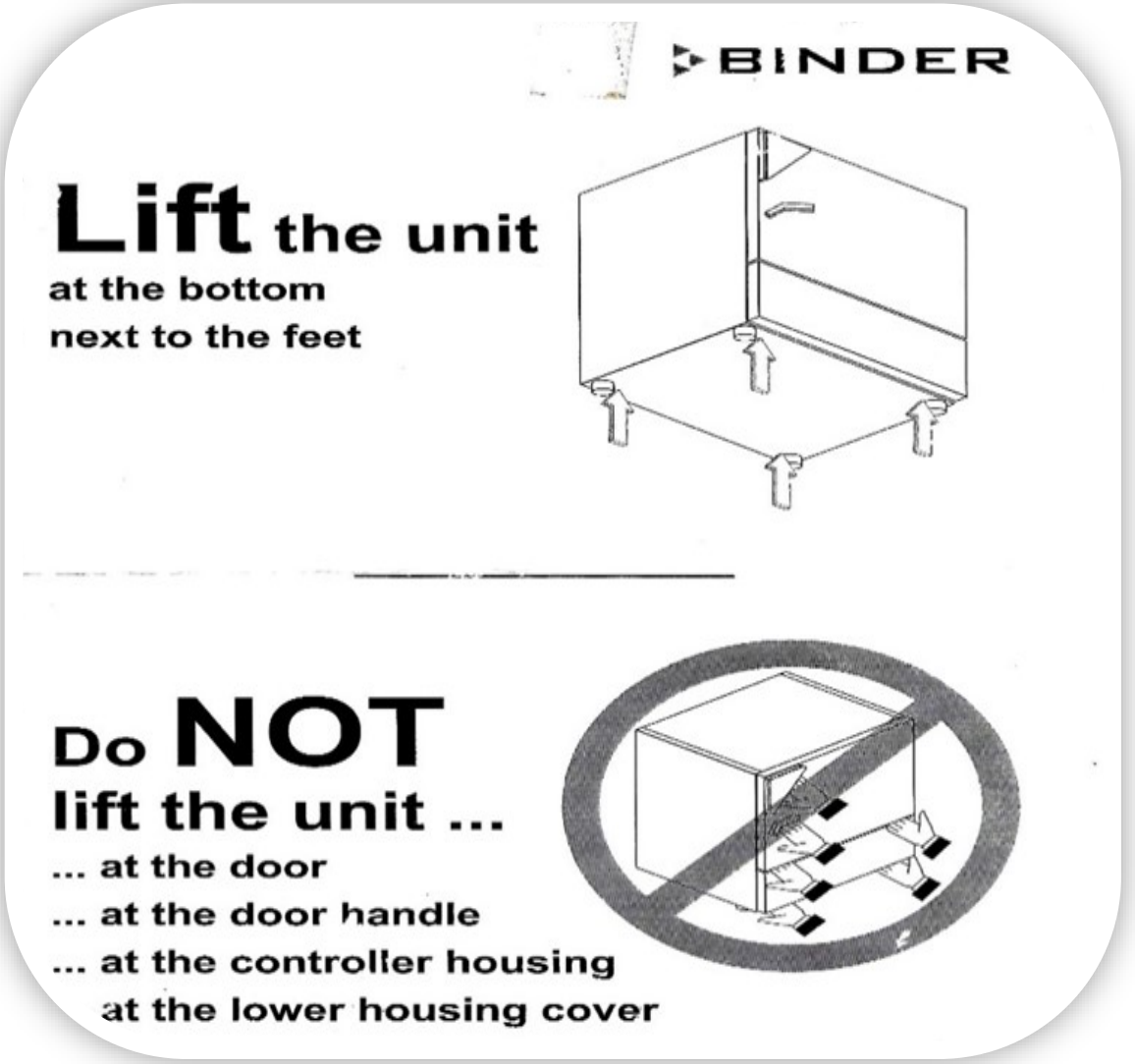
Due to the special demands of the Medical Device directive (MDD), these ovens are not qualified for sterilization of medical devices as defined by directive 93/42/EWG.

Temperature Safety Device Class 1 (Option)

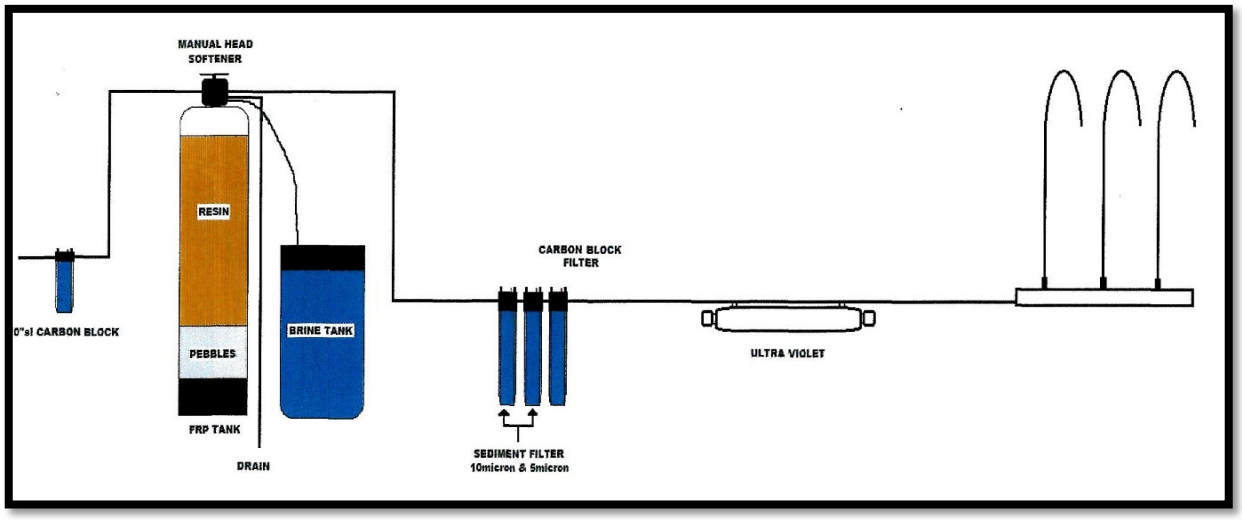
- The unit can be optionally equipped with a temperature safety device class 1 acc. to DIN 12880. It serves to protect the unit and prevents dangerous conditions caused by major defects.
- If the nominal temperature is exceeded by about 25 degrees, the over temperature protective device permanently turns off the unit.
- When the unit has cooled down, you can turn on the heating by pressing the rest button at the back of the unit. If the heating elements turn off repeatedly, have a specialists investigate and remove the reason of the failure. The reset button is located on the unit near, at the bottom right side.

DANGER
Electrical hazard Danger of death The unit must NOT become wet during operation or maintenance work. Do NOT remove the rear panel of the unit. Disconnect the unit before conducting maintenance work. Disconnect the power plug. Ensure all maintenance work is conducted by licensed electricians or experts authorized by BINDER.

NOTE:



10. WATER DEIONIZER



OPERATION / MAINTENANCE/ PRECAUTIONARY MEASURES

I. SPECIFICATION

- This manual was made to offer adequate information on the installation, operation and maintenance of this electro pump. It is suggested to read on this thoroughly.
- This centrifugal horizontal electro pumps with self-priming capacity is supplied with century system to reach suctions of up to 9 meters. Connecting a foot valve will automatically make this pump self-priming. It is advised to operate this motor with clean water at a maximum temperature of 45^0C.
- Please refrain from using any kinds of liquid aside from water. This pump was finished with first quality materials submitted to strict hydraulic and electric controls and verified in detail.
- Correct installation of this pump could be achieved by following this instruction manual and electric chart. Failure to do this may result to motor overcharge and other similar consequences.

II. INSTALLATION

- The pump should be installed where the suction pipe is as short and the suction lift is as small as possible.
- The pump should be sited in a well-ventilated but frost free position and safe from possible flooding. If the installation will be permanent, it is recommended that it has to be attached to the floor or ground using pump's holes bracket.

III. PIPE ASSEMBLY

- If the pump is to draw liquid from a level lower than the pump suction port, a foot valve must be fitted to the end of the suction pipe below the lowest liquid level to make it self-priming.
- When the suction pipe is longer than 10 meters, the use of a bigger diameter than the admission port of the pump is recommended. Every joint of the suction pipe must be completely tight.
- It is best to reduce pipe bends to the minimum inclination of 2%. The discharge pipe should be at least the same diameter as the discharged port of the pump to minimize pressure drop, high flow velocities and noise.

11.STEREO MICROSCOPE

OPERATION / MAINTENANCE/ PRECAUTIONARY MEASURES

BEFORE USE

1) Microscope ought to be placed in a dry and clean place. Do not expose the microscope in the sun directly. Avoid high temperature and violent vibration.

2) As microscope is a precision instrument, handle with care, avoiding impact or abrupt movement during transportation.

3) To keep the image clear, do not leave fingerprints or stains on the surfaces of lens.

4) Never turn the left and right focusing knob in the adverse direction at the same time, otherwise the microscope will be damaged.

5) Hold the camera with one hand for fearing of falling when you take the films out of the big camera.

MAINTENANCE:

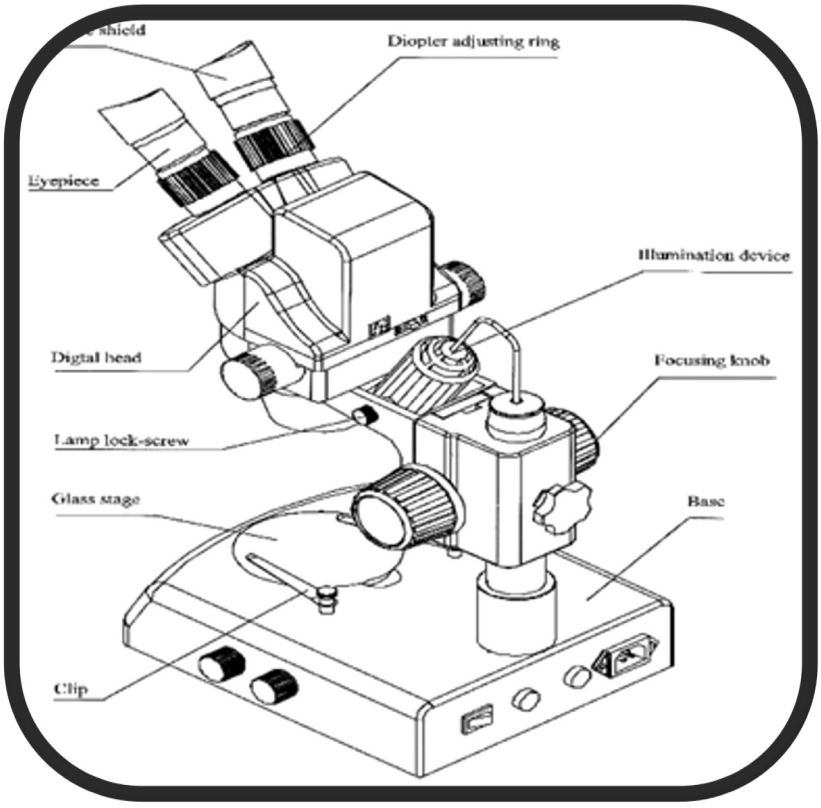
1. All lenses must be kept clean. Fine dust on the surface of the lens should be blown off with hand blower or wiped off gently with a soft lenses tissue; Fingerprints or oil marked on it should be wiped off with a tissue moistened with a small amount of xylene or 3:7 mixture of alcohol and ether.

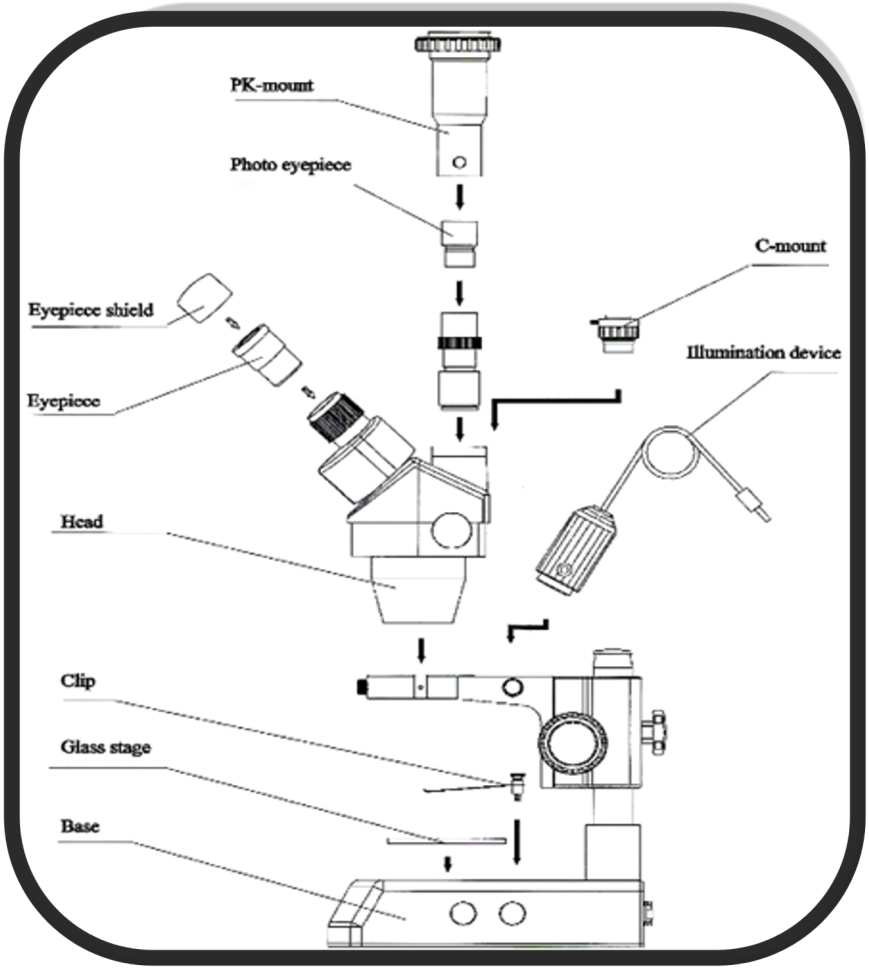
2. Never use the organic solution to clean the surface (especially the plastic surfaces). If necessary, please choose the neutral detergent.

3. Do not take the microscope apart for fearing that it is damaged.

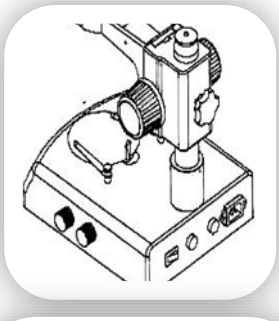
4. After using, cover the microscope with the dust-cover provided and store it in a dry and clean place free from moisture to prevent rust.

5. To keep the performance of the microscope, please check it periodically. The detail can be gotten from the agent nearby.


Diopter adjusting ring
Eyepiece
Illumination device
Digital head
Focusing knob
Lamp lock-screw
Glass stage
Base
Clip


PK-mount
Photo eyepiece
C-mount
Eyepiece shield
Illumination device
Eyepiece
Head
Clip
Glass stage
Base

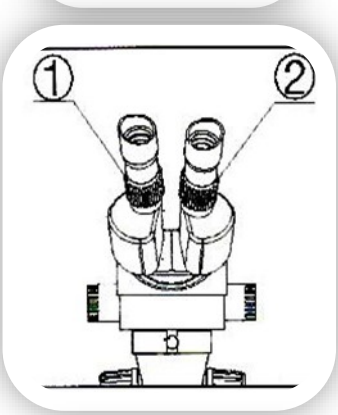
OPERATION



Use the glass stage

1) Press the glass stage on the sunken place then the other side of the glass stage will be lifted.

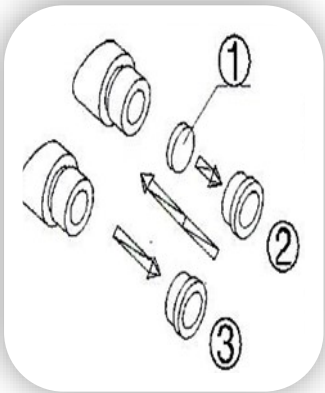
Adjust the degree of tightness of the focusing arm.



1) If you want to adjust degree of tightness of the focusing arm, you can hold one of the focusing knobs and turn another one to attain a suitable position. The degree of tightness relies on the direction to be turned. The clockwise direction is tight, otherwise, is lose.

2) The suitable position of tightness can make the adjustment more comfortable and prevent the focusing bracket from slipping down by its weight during the observation.

Set the specimen slide



1) Set the specimen on the center of stage plate. If necessary, clamp the slide with the clips.

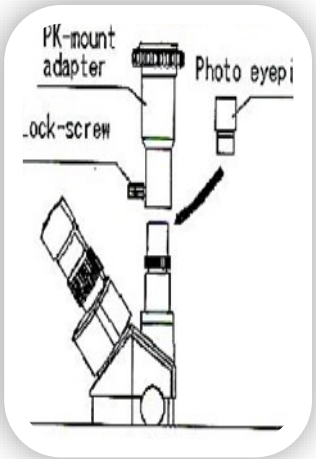
2) Turn on the light.

Adjust the specimen slide

1) Turn the zoom control knob to the maximum magnification.

2) Turn the dioptre adjusting rings to zero.

3) Observe the specimen through the right eyepiece and make the image clear by turning the focusing knob.



4) Rotate the zoom control knob to the minimum magnification.

5) Observe the specimen through the right eyepiece and make the image clear by turning the focusing knob.

6) Redo the step (1), (3), (4) and (5) till the right adjusting ring is more precise.

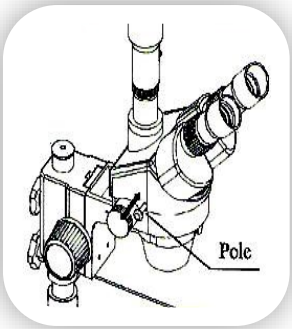
7) Do the step (4) and make the image clear which is observed through the left eyepiece by turning the left dioptre adjusting ring.

Adjust the prism housing along the direction of arrowhead till the observation is comfortable.

Use eyepiece shields

1) For user who does not wear glasses, hold the diopter-adjusting ring to prevent them from rotating and turn the eyepiece till the eyepiece shileds fits the observer well.

Install the illumination device.



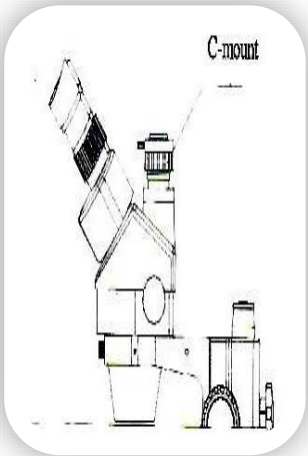
1) Insert the illumination device (1) in the bracket with the protrudent side toward the lock screw.

2) Put the plug into the socket of the pillar stand.

Choose the optical system.

1) You can alternate the binocular observation and video capture by pushing or pulling the pole. You can attain binocular observation by pushing the pole inside, or attain video capture by pulling it outside. No matter what optical system is chosen, push or pull the pole thoroughly.

Mount the photo eyepiece and the PK-mount adapter.



1) Put the photo eyepieces socket of the tri-colar.

2) Connect the PK-mount adapter with the photo eyepiece, an then tighten the lock -screw.

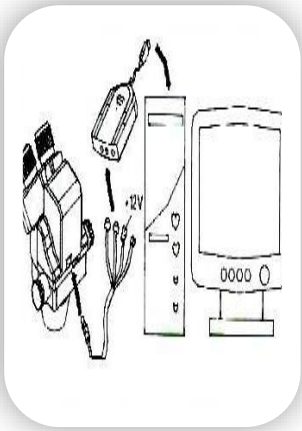
Adjust the CTV

1) Adjust the CTV to a sutable position by rotating C-mount .

Note: The range of the adjustment: 1~2mm in general.

3) Gently twist the mounting ring with the eyepiece micrometer into the eyepiece till tightening (2) securely.

4) To remove the eyepiece micrometer, take down the mounting ring (3) by twisting and take out of the micrometer, and then wrap it.



Appear the image on the Monitor or TV

1) Connect the power supply and then turn on the Monitor or TV.

2) For the monitor, the connect sign model must be chosen (C-video or S-video) and for TV, the channel must be set to the video channel.

3) Pull the pole out and adjust the focusing knob and then the image will appear on the screen clearly.

Connect with the computer.

1) Plug one end of the PVA cable into the socket of the digital head.

2) Plug one of the C-VIDEO or S-VIDEO into the A/D board.

3) Plug the USB of the A/D board into the USB socket of the computer.

4) If your computer is mounted capture card, you can connect the C-VIDEO or S-VIDEO with the computer directly.

5) Connect the 12V DC power with the power socket of the PVA cable.

- **Appear the image on the computer**

1) Turn on the power supply and let the computer work.

2) Install the software and the driver of the A/D board. (If they have been installed, this step can be omitted.

3) Double click the icon of the software, and then the video window will appear. You can set the size of the window according to your linking.

4) Draw out the pole and adjust the focusing knob, and then the image will appear on the computer screen clearly.

5) If no image or the image without colour, it may be because the model of the input signal does not match the output signal of CCD or the model of C-VIDEO/S-VIDEO is not correct.

- **Appear the image on the computer and the Monitor synchronously**

1) Do step 4.12 and step 4.14 to connect the computer and the Monitor.

2) Operate step 4.13 and step 4.15, we can make the image appear on the computer and monitor at the same time.

- **Adjust the image**

1) Put the base, stand and digital head correctly, then fix the lock screw tightly.

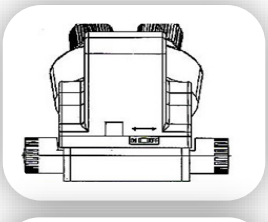
2) Put the object on the base stage.

3) Observe the object through the eyepiece and adjust the focusing knob to make the image of the object clearly.

4) Move the digital head or the object gently to adjust the image agreeing with observer.

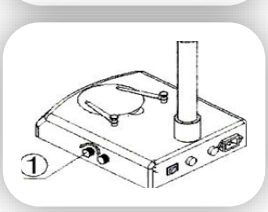
Brief instruction for the software.

1)The program design of the software is up to date, and the Chinese/English interface can be powerful delineation bar which be used much conveniently and rapidly. You can finish first most of analyze work only to click the mouse.



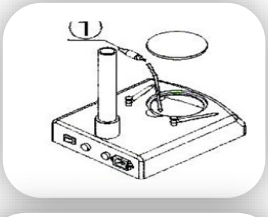
2) Can afford many powerful area choosing tools which can analyze any area your linking at will, such as adjusting hue and image, dealing with mathematical morphology, image matching, texture analyze, character identity and so on.

3) Geometry character measuring function, automatically analyzing function such as slightness body, grain body, line body and so on. The outcome can be kept in data and can be made into chart and so forth.



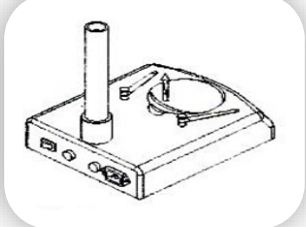
Use the white balance.

1) The CCD has no auto white balance when the white balance switch is on “ON”



2) Please put the switch on “ON in general. Let the switch be “OFF” only in special, for example, observing the red cell, otherwise the color of red cell will be adjusted into white.

3) If you want to observe another single color, please let the switch be “ON” again when you finish the observation, and put the switch on “OFF” again after auto balance, or the color of the image will be distortion.



Adjust the brightness of the bottom light

1) Turn the adjustment light knob (1) according to the sign marked on the base, along the clockwise the brightness will be added, otherwise it will be weakened..

Replace the lamps.

Chapter 8:

Inventory of Laboratory Equipment/Tools/Instruments

- **The process of listing equipment/tools/supplies/materials with the description, quantity and value of each is performed to keep track of multiple items and ensure that all laboratory equipment/materials/ supplies in the laboratories are in a complete or itemized list with the indicated quantity on hand.**

Procedure of Inventory of Laboratory Equipment/Tools/Instruments

FLOWCHART	RESPONSIBLE	DETAILS
Conduct inventory of items available in the laboratories	Laboratory Custodian	The laboratory custodian shall conduct inventories of items and conduct records to ensure accuracy. Inventory duties shall be performed quarterly.
Create reports of lost and damaged items	Laboratory Custodian	The laboratory custodian shall create reports of lost and damaged items. If there are discrepancies, she must investigate the issue.
Print duly accomplished inventory for the quarter to be signed by the immediate supervisor	Laboratory Custodian	The laboratory custodian shall print the duly accomplished inventory to be noted by the immediate supervisor.
File final copy of the inventory	Laboratory Custodian	The laboratory custodian shall keep a file of the duly signed inventory for the quarter.

APPENDIX A

SCIENCE LABORATORY HOURS OF OPERATION

DAY	TIME
ROOM 207	
Monday, Wednesday, Friday	**8:00 a.m. - 12:00, 1:00-7:00 p.m.**
Tuesday, Thursday	**8:00 a.m. - 12:00, 1:00-7:00 p.m.**

The science laboratories observe the College holidays, breaks or schedule of no classes.

The scheduled indicated are valid for most of the semester. Hours may vary during holidays, school breaks and/or no classes. Changes shall be posted in bulletin boards as needed.

Separability Clause

If any part of this manual is held invalid, the other revisions not affected thereby shall remain in force and effect.

Repealing Clause

All pictures, operational procedures of newly procured equipment, policies in the laboratory rooms, rules and regulations inconsistent with the revisions of this operation manual are hereby repealed or amended accordingly.

Effectivity Clause

This operation manual shall take effect this day upon approval of the Boards of Trustees.

Authors:

AREL B. SIA-ED, Ed.D

MARIA PAZ O. BALDO

EPIPHANIA B. MAGWILANG, Ed.D

NAZRENE F. MASKAY

Reviewed by:

LYDIA G. PLOMEN, PH.D

Chairman

Teacher Education Department

CHRISTIE LYNNE C. CODOD, ED.D

College Dean

Recommending Approval:

EMILY ANN B. MARERRO, DBA

Vice President for Academic Affairs

Approved:

REXTON F. CHAKAS, Ph.D

College President

Chemistry Laboratory Room