V.V.VANNIAPERUMAL COLLEGE FOR WOMEN

An Autonomous Institution Affiliated to Madurai Kamaraj University
(Belonging to Virudhunagar Hindu Nadars)
Re-accredited with 'A' Grade (3rd Cycle) by NAAC
VIRUDHUNAGAR - 626 001 (TAMILNADU)

DEPARTMENT OF BIOTECHNOLOGY

STANDARD OPERATING PROCEDURE
for the
EQUIPMENTS

2020 - 2021

सत्यमेव जयते
DEPARTMENT OF BIOTECHNOLOGY
Ministry of Science & Technology
Government of India

Under

DBT STAR COLLEGE SCHEME

FOR STRENGTHENING UG SCIENCE DEPARTMENTS
No.HRD-11011/163/2020-HRD-DBT DT.24.08.2020

DEPARTMENT OF BIOTECHNOLOGY
MINISTRY OF SCIENCE AND TECHNOLOGY, MHRD,
NEW DELHI

V.V.Vanniaperumal College for Women, Virudhunagar,Tamilnadu
No.HRD-11011/163/2020-HRD-DBT/Dt.24.08.2020/ Biotechnology/SOP for the Equipments

COOLING MICROCENTRIFUGE

Centrifuge is an equipment helps to separate mixtures by applying centrifugal force.

Principle:

A centrifuge works under the principle of sedimentation: Under the influence of gravitational force (g-force), substances separate according to their density. Particles are concentrated as a pellet at the bottom of the centrifuge tube and separated from the remaining solution, called supernatant.

V.V.Vanniaperumal College for Women, Virudhunagar,Tamilnadu
No.HRD-11011/163/2020-HRD-DBT/Dt.24.08.2020/ Biotechnology/SOP for the Equipments

COOLING MICROCENTRIFUGE

OPERATING PROCEDURE

Before using centrifuge check to see opposite terminal rings and shields are of the same weight. This can be done easily since the weights are inscribed on the terminal rings shields.

- Once centrifuge is turned ON, lid must be kept closed.
- Check that opposing sets of terminal rings and shields balance each other.
- Place experimental sample into the centrifuge tube and balance it against another water balance tube using the beam balance and squirt bottle.
- Place into terminal rings positioning balanced tubes opposite to one another.
- Once tubes are in place and all rotor positions are filled. Close the lid of centrifuge.
- Set the desired time on timer.
- Select appropriate speed setting on centrifuge with the speed selection knob. This simultaneously turns ON the centrifuge.
- Do not re-open it until it comes to a complete stop at end of run.
- Then centrifuge has stopped. Carefully remove tubes without agitating contents.
- Close the lid of centrifuge.
- Properly dispose of any waste material disposable bin and clean up the area around the centrifuge.

MAINTENANCE:

- Clean the centrifuge daily, or at least weekly.
- Remove the rotor and any sample or container holders.
- Interior cleaning includes the interior bucket, specimen holder, rotor and supports.
- Use a sponge, warm water and a mild detergent such as dishwashing liquid
- Do not use caustic detergents or any product containing chlorine ions. (Diluted bleach is sometimes used as a disinfectant, but at full strength can attack stainless steel and discolor or damage the bowl . A plastic scrub pad can be used, but products such as steel wool, wire brushes and other abrasives can damage coatings and lead to corrosion.
- Spills should be wiped up immediately.Clean both the exterior and the interior.
- Do not pour water directly into the chamber or flood the inside of the centrifuge with cleaner.

COLORIMETER

Photo colorimeter measures the intensity of colour concentration of any substance in the solution. The intensity of colour of a substance is in direct proportion to its concentration which in turn is measured in terms of transmittance / optical density.

COLORIMETER

STANDARD OPERATING PROCEDURE:

- Allow 5 minutes warm up period after switching on the instrument.
- Display Source 1 and Abs. LED glows.
- Press mode key to toggle between Abs and % T mode. Say Abs is selected.
- Select appropriate filter by rotating the filter disc.
- Take a blank solution (Example: Distilled water) in a test tube and insert the test tube in it is position in the test tube holder. Make sure that the mark on the test tube coincides that on the panel.
- Press REF key. The display shows. 00 at Abs mode (or 100% T at %T mode).
- Replace blank with another tube containing test standard solution.
- Record the Abs. reading of "Test standard" from the display say Astd.
- Now remove the test tube containing standard solution from the holder.
- Place the test tube containing sample solution in the sample holder. The mark of the test tubes should coincide with that on the instrument.
- Record the Abs. reading of the sample, say Asmp.
- For calculating the sample concentration,

  Abs (sample)/Abs (standard) * Concentration of standard
- Similarly place other samples and find their concentration. For performing some other test select appropriate filter and follow steps 4 - 12.
- For % T readings, select the %T mode and set 100% T as described above. Now put in sample solution and take the readings.
- If while taking sample readings in Abs. Mode, mode key is pressed, then the instrument shows the corresponding %T reading of the sample under test and vice versa.

MAINTENANCE:

- Instrument must be installed at a place free from vibrations.
- The instrument should be placed in clean and dust free environment, away from direct sunlight.The ambient temperature must be between 10˚C to 45˚C.
- Spillage of chemicals or reagents should be avoided. In case of accidental spillage, the instruments must be cleaned immediately with wet cloth.
- The instrument should not be used in the presence of inflammable gases.
- If the instrument is not used for a long time, it should be covered and placed in a dust –free environment.

INCUBATOR

Incubator is a device which provides and maintains all artificial optimal conditions for growth of microbial culture.

PRINCIPLE:

Incubator works on the principle of thermo-electricity. The incubator has a thermostat which maintains a constant temperature by creating a thermal gradient. When any conductor is subjected to a thermal gradient, it generates voltage called as thermo-electric effect.

INCUBATOR

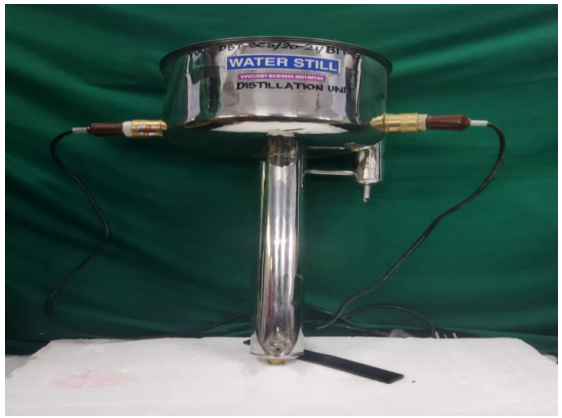
STANDARD OPERATING PROCEDURE:

- Ensure that the incubator is properly connected to the power supply.
- Switch on the main.
- Turn on the red colour power knob towards 0-1.
- Turn on the cooling knob towards 0-1.
- To set the incubator at 22°C , set the lower temperature 21ºC by pressing the 'SET POINT -1' and simultaneously adjust the temperature with the help of screw of SET and RST by screw driver.
- Set the higher temperature 23°C by pressing the 'SET POINT -2' and simultaneously adjust the temperature with the help of screw of SET and RST by screw driver.
- In the same manner the incubator can be set to 37°, 44° and 55°C whenever required by setting the lower temperature to 36°,43° and 54° C respectively and by setting the higher temperature to 38°,45° and 56° C respectively.
- Record the temperature twice daily. i.e. in the morning and in the evening. The temperature should not differ ± 2° C from the set temperature.

CARE AND MAINTENANCE:

- Hazards and risk associated with the use of incubator and precautions to be taken.
- All containers/materials placed in incubator should be labeled with name, date and contents.
- Containers/materials should be removed after the appropriate time of incubation to prevent overcrowding or contamination of the incubator.
- Any spillageor faults in the equipment should be reported immediately to the laboratory's technician and should be cleaned up in a manner appropriate to the material spilled.
- Where temperatures in excess of 370°C are in use, appropriate gloves must be worn.
- If an incubator is faulty, it should be switched off until repaired.
- Any cuts/burns sustained should be dealt with by first aid personnel and reported.

WATER DISTILLATION UNIT



Distillation is the traditional method of purifying a chemical liquid. It is also used to separate one component in a liquid mixture from another.

PRINCIPLE:

The water distiller purifies water by evaporation and condensation of the steam. It removes organic as well as inorganic material.

WATER DISTILLATION UNIT

PROCEDURE:

- The Distillation unit has 3 pipes
  - One which is connected to the water inlet.
  - Second from which distilled water would be collected
  - From the third pipe, wastewater would be discarded.
- Connect the water inlet pipe to the tap
- Switch on the main supply.
- Keep an empty, clean water container below the water outlet pipe to collect the distilled water
- Switch on the Unit
- Collect about 500 ml of Distilled water initially and discard it. Then collect the required amount of Distilled water in a container.
- The distilled water collected can be used in the lab, organic chemistry lab,clinic, fermentation, and medical industry.

BINOCULAR MICROSCOPE

Binocular microscope is used to carryout the microscopic analysis of blood cells and to detect abnormal changes in cells or tissues. It is a laboratory microscope reflecting a modern design as well as the latest in optical and mechanical advancements. This is designed for professionals as well as students; this microscope offers many features and functions for a diverse set of applications.

OPERATING PROCEDURE:

(a) **Turning the lamp ON**

- Flip the main switch to "I".
- Rotating the light intensity Adjustment Knob in the direction of the arrow increases brightness and rotating it in the opposite direction decreases brightness.

(b) **Placing specimen on the stage**

- Place the specimen gently on the stage.
- Rotate the Coarse Adjustment Knob in anticlockwise direction to fully lower the stage.
- Open the bow shaped lever outward by pulling lever handle, place the specimen by sliding the specimen glass plate on the stage

- After positioning your specimen slides, return the bow shaped lever gently by slowly releasing control knob
- Rotating the upper co-axial knob controlling which is the Y axis movement move the specimen in the vertical direction. Rotating the lower knob which is the X axis movement control knob moves the specimen in the horizontal direction.
- When the specimen holder reaches the stop position, Stop rotating the knob at this time.

(c) **Adjusting the focus**

- Rotate the coarse adjustment knob clockwise so that the objective is as close as possible to the specimen.
- While observing the specimen through the eyepieces, slowly rotate the coarse adjustment knob counter clockwise to lower the stage.
- when coarse focusing of the specimen is obtained, rotate the fine adjustment knob for fine focusing.

(d) **Adjusting the Interpupillary Distance**

- The interpupillary distance adjustment consists of regulating the two eye pieces to align with both eyes pupils so that one can observe a single microscopic image through the two eye pieces in stereo vision. This greatly helps to reduce fatigue and discomfort during observation.
- While looking through the eye pieces, move both eye pieces until the left and right field of view coincide completely. The position of index dot indicates the Interpupillary distance value.

(e) **Adjusting the condenser position and aperture Iris diaphragm**

- The condenser is most often used in the highest position. If the observed field of view is not uniform enough, it may be improved by lowering the condenser slightly.
- Rotate the condenser height adjustment knob in clockwise direction to move the condenser to the highest position.
- Slide the aperture Iris diaphragm, so that the aperture of the objective in use is fully illuminated.

(f) **Switching the objective:**

- Hold and rotate the revolving nose piece so that the objective to be used is in line above the specimen. Always use the ribbed grip to rotate the objective nose piece.

CARE AND MAINTENANCE:

- To clean the lens surfaces, remove dust using a soft brush or gauze lightly moistened with cleaning solution (85% petroleum ether and 15% isopropanol) should be used.
- For cleaning the objective optics, use xylene. Observe sufficient caution in handling xylene.
- To remove oil, use a solution of diluted hand soap liquid initially. If this does not produce a satisfactory result, repeat the cleaning using a solvent.
- Cleaning is achieved by using a spiral motion from the center of the rim. Never wipe using zig –zag movements as this will only spread the dirt. Normally several spiral wipes (starts initially at the rim before moving to the middle and then followed by a center to rim)are recommended.
- Avoid the use of any organic solvent for cleaning of painted surfaces of the instrument. Painted surfaces can be cleaned with very lightly moistened micro fibre cloth.

AUTOCLAVE

Autoclave is a specialized equipment designed to deliver heat under pressure to a chamber, with the goal of sterilizing the contents of the chamber. The autoclaving process is typically used to destroy microorganisms and disinfect labware, equipment.

AUTOCLAVE

OPERATING PROCEDURE:

- Place bag to be autoclaved into a shallow pan or tub.
- Place the pan and bag inside the autoclave. . There should be at least 2 inches of space around each waste bag on all sides to allow access to surfaces by steam.
- Run the autoclave at a chamber temperature of 121°C for 60 minutes , using a dry cycle run. (121°C is a standard temperature for autoclave operation, and generally achieved when chamber pressure is 15-16 psi).
- When the cycle has been completed, verify that the autoclave chamber and ambient pressure are the same.
- The chamber may now be opened and the waste bag removed. Also use caution when opening the autoclave door, as a small amount of hot steam may be released when opening the chamber.
- Verify that the cycle ran appropriately by visualizing the heat indicator tape or strip.
- Once the bag has cooled, place the treated waste bag inside a black plastic bag and close the bag either by knotting or with a twist tie. The treated waste may now be discarded as normal solid waste.
- Please be sure and select the most appropriate cycle for rendering biohazardous materials non viable for disposal.
- The above instructions are for solid waste, however if the materials you need to autoclave are liquid cultures, be sure to use the liquid autoclave cycle to avoid creating a mess within the autoclave due to overflow of liquid from the container(s). Always use secondary containment for liquids when autoclaving such as a shallow pan or tub.

CARE AND MAINTENANCE

- Do not overload the autoclave
- No other materials should be autoclaved together with waste in the same load.
- Wear autoclave gloves when handling hot items.

VORTEX MIXER

The vortex mixer is a bench top vibrator designed to operate with direct ON and Speed control option. The instrument is designed for vortex mixing of liquids in laboratories, school or factories.

VORTEX MIXER

OPERATING PROCEDURE:

- Connect the CM 101/Cm 101 Plus three pin power plug to a suitable three pin 230 v AC power socket having proper earthing. When the Unit is connected to power supply, the diamond lamp will glow.

(a) **Continuous Operation:**

- Put the instrument on the table and safe place and plug in the main power.
- Push the bi-directional switch upward to the 'ON' mode and power LED is lit. Instrument is now ready to work.
- Turn the motor egulation knob to set the speed.
- Push the bi -direction switch downward to the 'OFF' and LED is off. Instrument is now turned off.
- To protect instrument from overheating, do not operate the instrument more than 30 minutes continuously.

(b) **Touch operation:**

- Put the instrument on the stable and safe place and plug in the main power.
- Push the bi-direction switch downward to the touch mode.
- Turn the motor Regulation Knob to set the speed.
- If the test tube is pressed into the mixing head vertically, the instrument will begin to work and the power LED will be lit.
- Push the bi-direction switch upward to the OFF mode and LED is off. Instrument is now turned off.

(c) **Maintenance:**

- Proper maintenance can keep instruments working in a good state and lengthen its life time. Unplug the power line when cleaning.
- Be careful not to spray the cleanser into the instrument when cleaning.
- Wear the proper protective gloves during the cleaning of the instrument.
- Electrical parts should not be placed in the cleansing agent for cleaning.
- Keep the instrument clean and prevent liquid splashing into the instrument.

MAGNETIC STIRRER WITH HOT PLATE

A hot plate magnetic stirrer is used for mixing and heating aqueous solutions simultaneously to speed up the reaction and dissolve the solute in the solvent.

MAGNETIC STIRRER WITH HOT PLATE

OPERATIING PROCEDURE:

- Place the magnetic stirrer on a stable well-leveled surface.
- Place the stir bar at the bottom of a glass container.
- Fill the glass container with the liquid to be stirred.
- Plug the mains cable into a suitably earthed socket.
- Check that the speed control knob is completely turned anti-clockwise.
- Place the glass container on the centre of the magnetic stirrer.
- Press the On/Off switch to turn the magnetic stirrer on.
- The switch will light green.
- Adjust the speed control knob to a low stirring rate.
- Continue to adjust the speed control knob until the desired stirring speed is achieved.
- Wait until the liquid is properly mixed.
- Completely turn the speed control knob anti-clockwise.
- Press the On/Off switch to turn the magnetic stirrer off. Manipulate another stir bar from the outside of the glass container to remove the immersed stir bar.

CARE AND MAINTENANCE:

Thoroughly wash the stir bar with distilled water after each application.

Store stir bars in pairs to maintain their magnetic strength and increase their life span.

DOUBLE WALLED TEMPERATURE CONTROLLED WATER BATH

Thermostatic water bath is used for incubation of test samples underwater at constant temperature over a long period of time.

DOUBLE WALLED TEMPERATURE CONTROLLED WATER BATH

OPERATING PROCEDURE:

- Ensure that the instrument is clean and calibration of temperature indicator is within due date of calibration.
- Fill and check the water level, if required fill purified water to the acceptance level. The minimum water level is indicated by a black line on the water level indicator on the left.
- Switch ON the ring both by pressing ON/OFF switch.
- The digital temperature controller cum indicator will indicate the actual temperature of the water.
- Set the desired temperature by pressing the PRESS to SET switch and adjusting the SET pot

CARE AND MAINTENANCE

- Instrument calibration is one of the primary processes used to maintain instrument accuracy.
- The timer set for water bath and temperature should be adjusted properly as per requirement and checked in regular intervals.
- The procedure involves working with high voltage that can cause injury and death so the instrument should be handled with care under supervision.
- If the water bath feels faulty, don't use the instrument and immediately switch OFF the instrument.

MICROWAVE OVEN

Microwaves are high frequency electromagnetic waves the energy released enable the microbiological media to be heated without changing either the form or the colour. Microwaves generated by the magnetron reflected at cavity and are distributed uniformly as the media rotates on the turntable.

MICROWAVE OVEN

OPERATING PROCEDURE:

The oven must be plugged into appropriate wall socket. The turn table must be in the position in the oven. If the power level other than the maximum 100% - 800 W is used, the water takes longer to boil

- Open the oven door by pulling the handle.
- Place the prepared media on the turntable.
- Close the door.
- Press the START button and set the time by pressing +30S button for an appropriate number of times.
- The oven light comes on and the turn table starts rotating.
- At the end reminder signal will beep three times.

CARE AND MAINTENANCE:

- It is important to clean the microwave properly with a semi-wet cloth to ensure that it is free from any kind of particles.
- The substance to be heated needs to be covered before heating to prevent spraying.
- Suitable microwave glass dishes should be only used as they are able to withstand the temperature of the microwave.

Microwave use

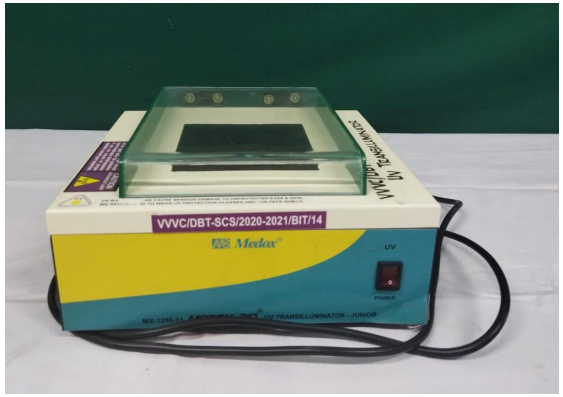
- Appropriate temperature and time need to be set up before the substance is placed in.
- While the substance is being heated up the microwave door needs to be tightly shut to avoid any accidents.
- It is important to wait for 3-6 seconds before opening the oven door after the substance is heated.

After use

- The container may not be as hot as the material inside it therefor one need to be extremely vigilant while taking out liquids from the oven.
- There will be rapid steam evasion when lids and foils are opened.
- The tray placed on the lower end of the oven needs to be cleaned adequately after every use.
- Sanitization of the outer and inner region of the oven is crucial.

.

UV TRANSILLUMINATOR



Transilluminator is used to study the results of electrophoretic patterns accurately. Gels after staining are placed on transilluminator and image can be seen directly by naked eye.

UV TRANSILLUMINATOR

OPERATING INSTRUCTIONS:

Installation:

- The instrument must be placed on a bench leaving at least 10 cm of space all around in order to avoid any obstacle that may reduce the ventilation.
- Connect the instrument to the power using power cable. The power font must be able to deliver at least 230 V A with a voltage between 100 and 240 VA. The plug must have a ground connection.

Using the Transilluminator:

Place gel/sample on the filter area. It is recommended that researchers place the gel on a Gel-Tray which is UV Transparent to protect the filter surface from the cuts and scratches.

Close the UV Shielding cover to avoid direct exposure to the UV rays.

The transilluminators can be turned on with the wavelength selector knob by press ON/OFF switch to ON.
The tubes within the unit will begin glowing beneath the filter.

After viewing the sample, turn on the transilluminator off and remove the gel and wipe the filter surface using tissue paper.

General precautions:

It is recommended that gloves be worn to prevent skin contact with gel and staining agents. Ensure the UV shield is closed while visualizing the gel. Avoid direct exposure to the UV rays.

Plug the transilluminator on an electric line with ground connection.

The transilluminator is equipped with thermal protection to prevent overheating.

Do not pour liquids directly on the transilluminator.

Do not block the aeration slits.

Switch off the instrument immediately after its use. Exposure of the gel to UV rays for longer time will affect the result. Don't leave the gel on the filter for prolonged period as this will result in fungal contamination.

The transilluminator surface is a UV filter. Clean the UV filter surface after use. When using the transilluminator with samples stained with Ethidium bromide, decontaminate the transilluminator surface with bleach. Denatured alcohol can also be used. Always wear disposable gloves

ORBITAL INCUBATOR WITH SHAKER

Incubator shaker is a temperature controlled instrument which is carried out both incubation and shaking functions, used in cell culture, fermentation, hybridization under controlled temperature and shaking speed.

ORBITAL INCUBATOR WITH SHAKER

OPERATING PROCEDURE:

Place the sample material in an acceptable container with a lid

Gently press the container in one of the spring housings until it is securely in place.

Shaker operation

- Close the lid of the incubator and turn on the machine using the power switch to the right hand side.
- The LED display will momentarily show the model number. (NOTE: the shaker will not operate of the lid is open)
- Once the machine is powered on, the incubator may start running. Pressing the start/stop button will cause the shaking to stop.
- Press the select button until the RPM indicator is illuminated on the left hand side of the control panel.
- Use the arrow keys to set the RPM of the shaker. A value from 50 to 400 RPM is available. The number will set when no buttons are pressed.
- Press the select key until the ºC INDICATOR illuminates.
- Set the temperature using the arrow keys. Temperature range is from 4º to 60ºC
- Press the select key until the HRS INDICATOR is illuminated.
- Use the arrow keys to set the TIME of the shaker. This can be a value from .1 to 99.9. The number will set when no buttons are pressed. If a continuous run time is desired, simply press the start stop button.
- Press the START/STOP key. The shaker will start in untimed mode.
- Press the START/STOP key again. The shaker will stop and the display will read OFF.
- Press the START/STOP key a third time; the time indicator will light and the shaker will now start the timed run.
- The machine will come to a stop once the timed run has ended. If running in untimed mode, the START/STOP key can be pressed at any desired time.

Machine Shutdown

Make sure the machine has come to a complete stop and open the lid.

Use a hot glove if high temperatures were set

Turn off the power by flipping the switch on the right side of the machine

.

LAMINAR AIRFLOW CABINET

Laminar Air flow chamber is used to transfer the microbial culture in aseptic condition.This equipment is used for providing an excellent aspetic worktable for processes like sub-culturing, inoculation, assays sterile drug preparation etc.,

LAMINAR AIR FLOW CABINET

STANDARD OPERATING PROCEDURE

- Before one hour of your work start the laminar air flow main power switch ON
- Then clean the platform of laminar air flow with 70% ethanol
- Close the door of Laminar Air Flow
- Now switch ON the UV light of Laminar Air Flow for at least 45-60 minutes.
- After then wash your hand with any disinfectant to avoid contamination.
- Switch OFF the UV light.
- Start Laminar Air Flow and open the door of laminar air flow.
- Flame the burner and start your work.
- After completion of your work. Wash your hands.
- Clean the platform with 70% ethanol.
- Close the door and switch off the power of laminar air flow.

.

LCD DIGITAL MICROSCOPE

LCD Digital Microscope is an efficient tool to analyse various objects from micro-fabricted parts to large electronic divices.It can be connected to a TV or Projector for demonstation work.

LCD DIGITAL MICROSCOPE

STANDARD OPERATING PROCEDURE

(a) Projecting the Microscope to Screen

- Power ON the Microscope, Power ON the Computer and Power ON the Camera
- Focus the specimen in the microscope eyepiece for normal observations(this requires that the View Selector Rod is in the full "in" position to deflect light toward the eyepieces).
- Pull the View Selector Rod (blue box on diagram) on the right side of the microscope frame supporting the eyepiece to the "out" position. This deflects light from the eyepiece to the camera
- If you still see any light in the eyepieces, pull the View rod to the full out position.
- When finished with the camera/projector, push the View rod to the "in" position to resume using the eyepiece for adjustments or another specimen (Note: If the projected view dims or adjust automatically to an unsatisfactory image, adjustments can be made on the camera Auto Exposure modes .A setting to manual mode is often effective).

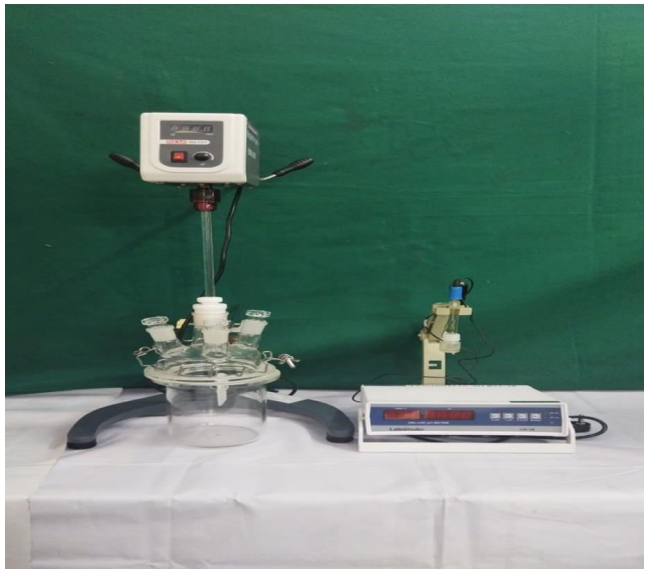
(b) To Capture Images from the Microscope

- Power on the computer and Power on the microscope
- Insert a slide and focus
- Move view selector (on microscope) to camera view.
- Run 'Adobe Photoshop Elements 4.0'.
- Click 'Start From Scratch' icon on the welcome screen.
- . Click the 'Cancel' button.
- Click the 'File' menu, then 'Import', and last 'USB 2.0 Camera…'.
- Click the 'Snap Shot' button and then the 'Cancel' button.

CARE AND MAINTENANCE:

- Avoid removing the lens cap in the dusty environment
- When removing the lens cap or mounting a lens, hold the camera face down to prevent dust from falling on the sensor surface.
- When the camera is not being used, the lens cap should be replaced.
- Use a professional dust removal tool to remove any dust on the camera optical filter.
- Use the only original power adaptor. Ensure the adaptor and associated cables are free from items that may cause damage.

BIOREACTOR



A bioreactor is a large vessel, used to growcultureon alarge scale under optimum conditions to produce large quanitities of the desired products such as antibodies, enzymes, vaccines and other metabolites

STANDARD OPERATING PROCEDURE

Operation : Fermentation

The temperature to be used during the fermentation, reduce the flow of water to the heat exchanger by partially closing the "Cooling Water Valve." This valve should remain open just a "crack."
. If the fermentation is to be performed aerobically, turn the "Sparge/Overlay Valve" fully clockwise to "Sparge."
After the medium has cooled to the desired fermentation temperature, sparge the fermentor with either sterile air or oxygen, as required, to saturate the medium with oxygen.
Fermentor Inoculation: Depending on the inoculum volume (~50-1,000 mL), the inoculum can be added to the fermentor using a large sterile syringe and a sterile large-bore needle.
Foam Control: If the medium is foamy, add a few drops of sterile antifoam using

a sterile needle/ syringe assembly. Add the anti-foam through one of the sterilizable, self-sealing septa on the fermentor lid.

Sampling the Fermentor

To periodically collect samples during the fermentation, open the "Vessel Port Steam Valve." This will send steam through the sampling port to sterilize it and prevent introduction of contaminants during the sampling procedure.
After 1-2 minutes, remove the cylindrical metal "sleeve" from the sampling port.

. Position a collection vessel (e.g. a beaker or flask) below the sampling port and turn the sampling valve clockwise until the medium drains from the vessel into the sampling container.
When a sufficient sample has been collected, turn off the sampling valve until the drainage stops.
Replace the metal sleeve over the sampling port and steam the valve for ~2 min

(as stated above

in Step 8a).

Harvest and Shutdown

When the fermentation is complete, drain the fermentation contents from the fermentor into a collecting vessel by performing the following steps:
The pH controllers should be turned off; however, agitation should be continued to keep the cells in suspension.
Shut off inlet gas flow by turning "Inlet Air Control Valve" clockwise. Allow

the vessel pressure to reach zero PSIG.

To drain and collect the contents in the fermentor, open the port by pushing the

handle down.

After the fermentor has been drained, open one of the additional ports on the fermentor lid and fill the vessel about half full with deionized (DI) water until cover the DO and pH probes.
Re-seal the vessel.

Then re-sterilize the fermentor (as listed in the "Sterilization" procedure) to kill any remaining microbes.
Allow the fermentor to cool.

Then drain and discard the water from the vessel.

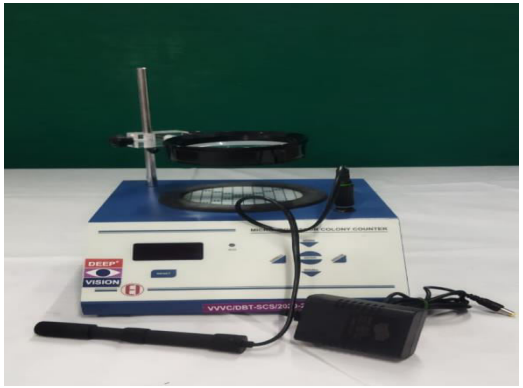
Clean-up Procedures

After the fermentor has been harvested, remove all attachments and all connections from the top of the head plate.
Fill the fermentor vessel about halfway with warm tap water.

Add a non-abrasive detergent and turn on the agitator (~150 rpm) for a Ten minutes
Turn ON the agitator and drain the fermentor. Once drained, turn OFF the agitator. 5. Rinse the inside of the fermentor with distilled water. Then, drain again.
Fill the fermentor vessel with tap water. Clean up the surrounding work area.

:

DIGITAL COLONY COUNTER



Colony counter is an instrument, used to count microbial colonies on a agar plate containing a growth medium.

DIGITAL COLONY COUNTER

- Take the bracket, and put its unprotected edge into the rim in the rear part. Check that the gum foot groove fits perfectly with them. Put the bracket carefully. flat to the rear part of the instrument.
- Place the magnifying glass holder rod into the bottom and thread it into the female of the bracket.
- Pass the magnifying glass holder through its rod and adjust the height.
- Connect the fiber pointer to the terminal.
- Connect the mains lead to its base and switch ON the instrument by means of the switch.
- To use transmitted light, turn ON the correspondent switch. Better light connect the feeder terminal too
- To contrast the Petri dishes media with the black screen provided, proceed as follows: Take out the centering device and the protector glass.
- Place the black screen, the protector glass and the Petri dishes centering device on the base of the instrument
- Switch OFF the transmitted light by means of the switch
- Push "reset" button, and the instrument is ready to work.
- Once you have decided the type of light and screen to be used, place the Petri dish on the hole of the centering device.
- Slide the centering device up and down until it reaches the desired position.
- Slide the centering device up and down until it reaches the desired position.
- Touch the Petri dish with the marker on the point where a colony lies. Once a count is made, the instrument gives a slight acoustic signal. The intensity of this signal can be adjusted by means of the red turn button in the back side of the counter.
- Once the counting is finished, write the number that appears on the digital display, and push the "RESET " button. The instrument is ready to start again .

LIGHT MICROSCOPE

The Light Microscope enables us to view things that are too small to be seen with the naked eye. It uses a system of two or more lenses to collect and focus the transmitted visible light through a specimen to the eye. Animal cells, plant cells, protozoa and bacteria can be easily seen

LIGHT MICROSCOPE

STANDARD OPERATING PROCEDURE

- Take out the microscope from the box and put it on a stable and flat table.
- Put the eye-pieces into the head tubes. Screw up the objective to the nose pieces serially if not already fitted.
- Adjust the mirror so that the light passes to the eye piece. You can put a table lamp if direct sunlight is not available. Set an angle so that light passes from center of the microscope.
- Place the specimen slide between two clamps of the mechanical stage.
- Bring the low power objective say 10X in field.
- Move the stage up by coarse adjustment knob till it stop on pre-slot lock.
- Bring the specimen to be examined just under the objective.
- Open the iris diaphragm fully by lever situated on the periphery under the condenser.
- Focus the specimen slide by Coarse Adjustment Knobs. This will bring the object in rough focus.
- Adjust the Fine Focusing Knobs gently to get a sharp and well defined image of the object.
- Contrast in the field can be adjusted as per the requirement by moving the diaphragm up or down.
- Change over to low or high power objectives according to the magnification required.
- Set every time the iris diaphragm and intensity of light according to the objectives.
- The objectives are supplied par-focal with the microscope, therefore the image of the object does not disappear when changing over to different power objectives. Only focusing knobs are required to be adjusted to get sharp image of the object.

CARE AND MAINTENANCE

- The objective lenses and eyepiece should be cleaned with the help of silk cloth and cleaning liquid before using.
- The microscope should not be tilted when working, using it.
- When an object needs to be studied, focus on low power objective first and then move to high power.