

LABORATORY EQUIPMENT

USE of MICROSCOPE

DISINFECTION - STERILIZATION

Tubes:

It is a cylindrical material made of glass or plastic in different sizes and diameters, with one end open.

It can be used in the production of microorganisms with solid, semi-solid, liquid media or in processes with various liquids. There are various types according to the purpose of use.

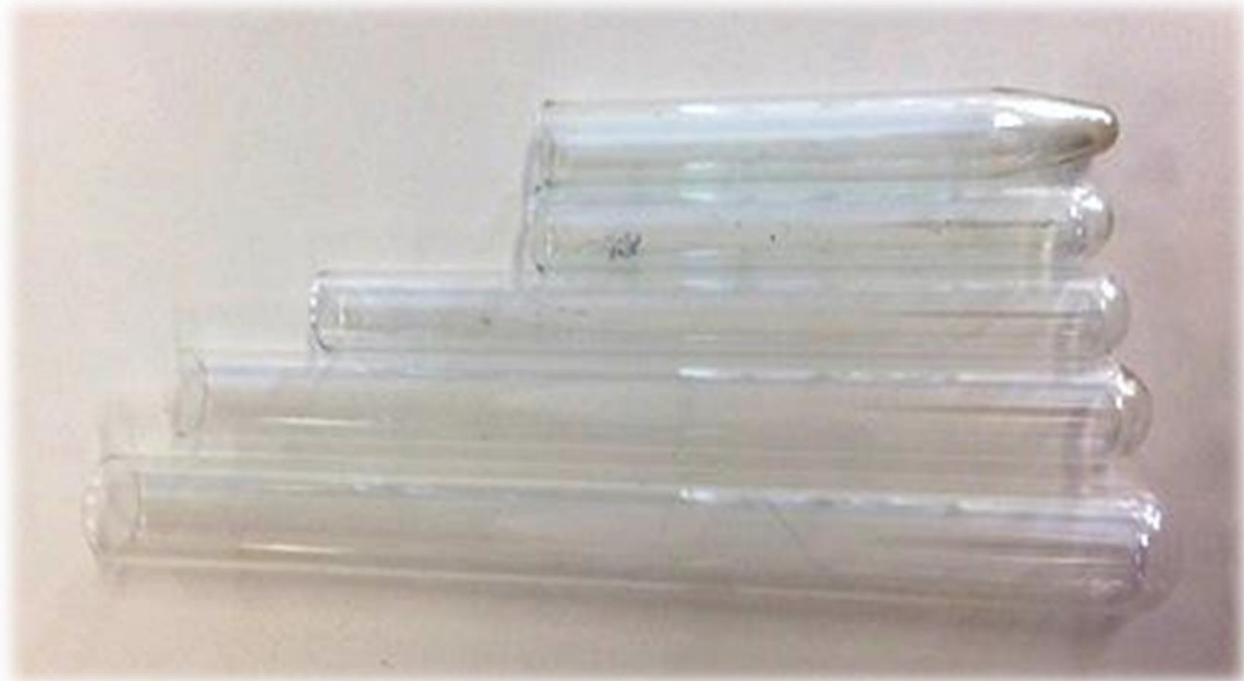
Test tube

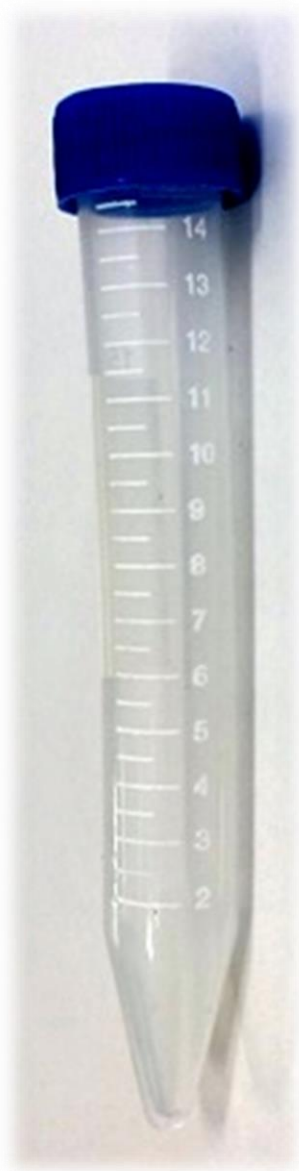
Serology Tube

Agglutination Tube

Hemolysis Tube

Centrifuge Tubes

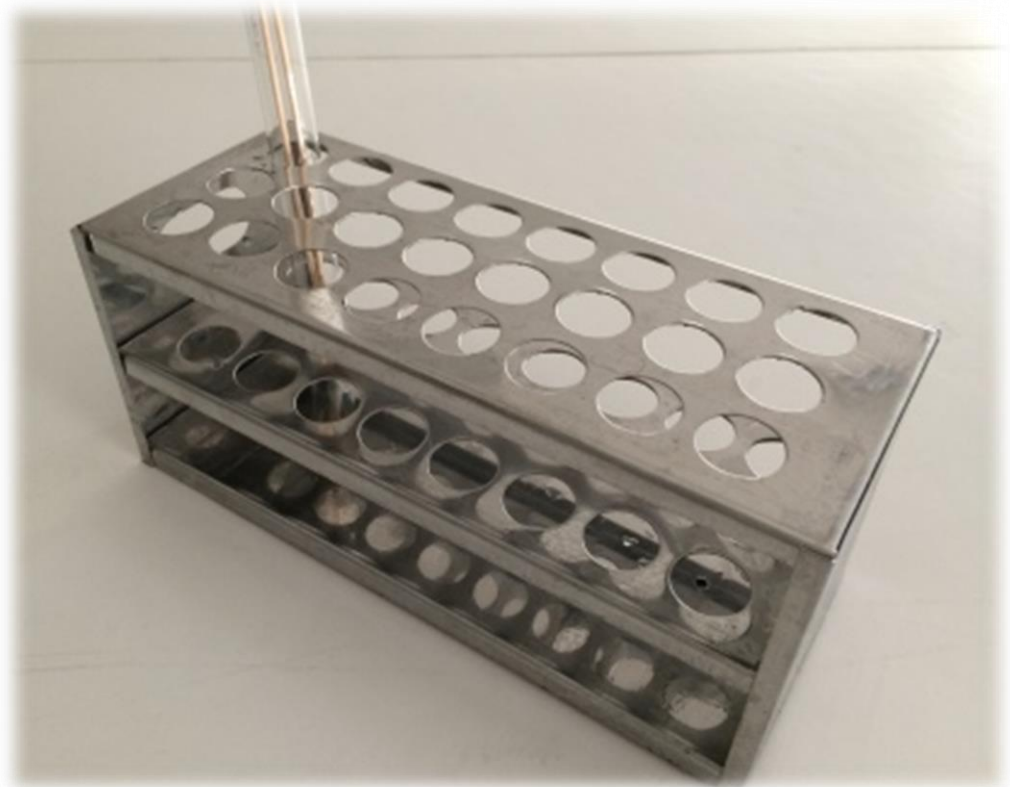




Tube holder:

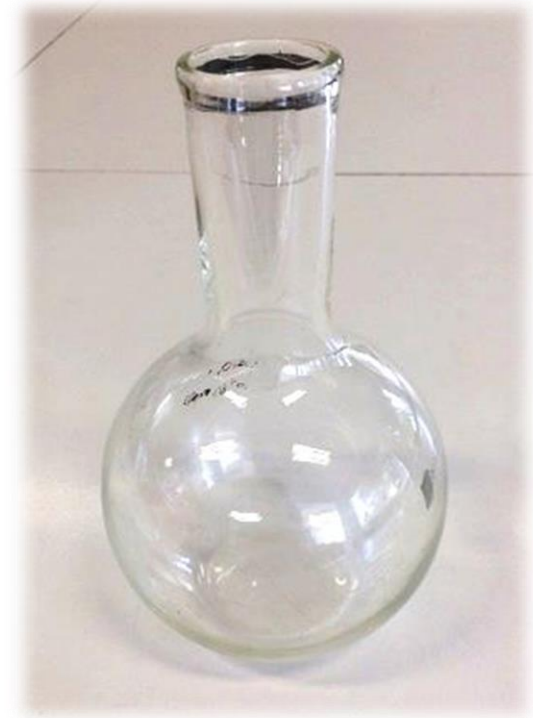
It is a device made of metal or plastic, containing cavities to hold the tubes in an upright position.

Available in different sizes, suitable for every tube.



Round bottom flask:

Its body is a sphere, its neck is a cylinder and its base is a flat glass container. It is used for the preparation and storage of liquids and media.



Volumetric flask:

Its body is conical balloon and its neck is thin cylindrical. It has a volume line on neck. It is usually made of glass material and has a plastic cover. Used in solution preparation.

Beaker:

It is a cylinder-shaped container made of glass or plastic, with a flat base, a bent mouth for liquid transfer, and degrees on it. It is mostly used in boiling or mixing processes in microbiology.



Measure tube (Graduated cylinder):

It is a a long cylinder, with a bent mouth for liquid transfer, and made of glass or plastic with degrees on it. It is used in liquid amount measurement.



Erlenmeyer:

It is used in the preparation, sterilization and storage of media and various liquids as well as production of microorganisms.

It is glass material with a short cylindrical neck, a conical body and a flat bottom.



pH Meter:

It is used to measure the acidity / alkalinity degrees of media and solutions.

There are varieties in the form of strips or electronic devices that perform precise numerical measurement with probe.



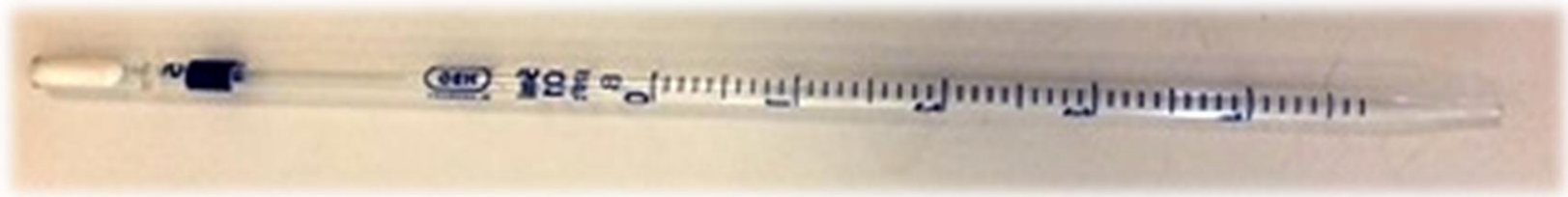
Glass pen:

They are pens that are used to write on glass material. It is heat resistant but soluble in alcohol.

Pipette:

It is a graduated, cylindrical material used to transfer a certain amount of liquid, usually made of glass.

It is used with a cotton pad in the mouth part to prevent contamination.



Pipette filler:

It is a device that works with a vacuum system and is used to syphon harmful liquids with pipette.

It is attached to the mouth of the pipette. There are manual or electronic types.



Automatic Pipette:

It is used in the process of syphon a certain amount of liquid in milliliter (ml) or microliter (μl) by semi-automatized measurement.

It is produced in neck size suitable for the measurable liquid range.

There are plastic pipette tips for each.

It is produced in sterile / non-sterile forms.





Pasteur Pipette:

It is used to transfer a small amount of liquid without measure from one place to another, both ends are open, one end is very thin capillary structure and is generally made of glass.



Dropper:

It is a plastic device with one end closed, which can be transferred up to 3 ml.



Petri Dish:

It consists of two cylindrical or rectangular parts, one of which covers the other as a cap.

It can be produced from glass or plastic material.

- Plastic petri dishes are disposable and are presented after being sterilized and packaged.
- Glass petri dishes are cleaned in the laboratory, sterilized and used repeatedly.



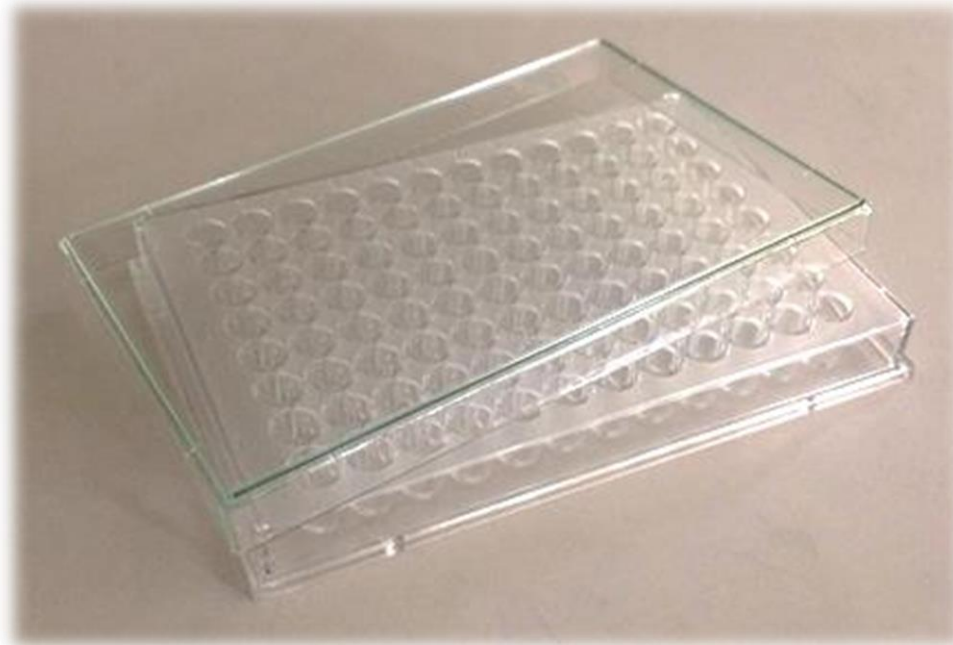
Petri Dish:

- The most common use in microbiology is the production of microorganisms in solid media.
- It can also be used for eukaryotic cell culture.
- Since it is transparent and flat, it is suitable for examination under a microscope.
- Some of them are specially designed for surface contamination tests or counting, which are very thin and marked with compartments.

Microplate:

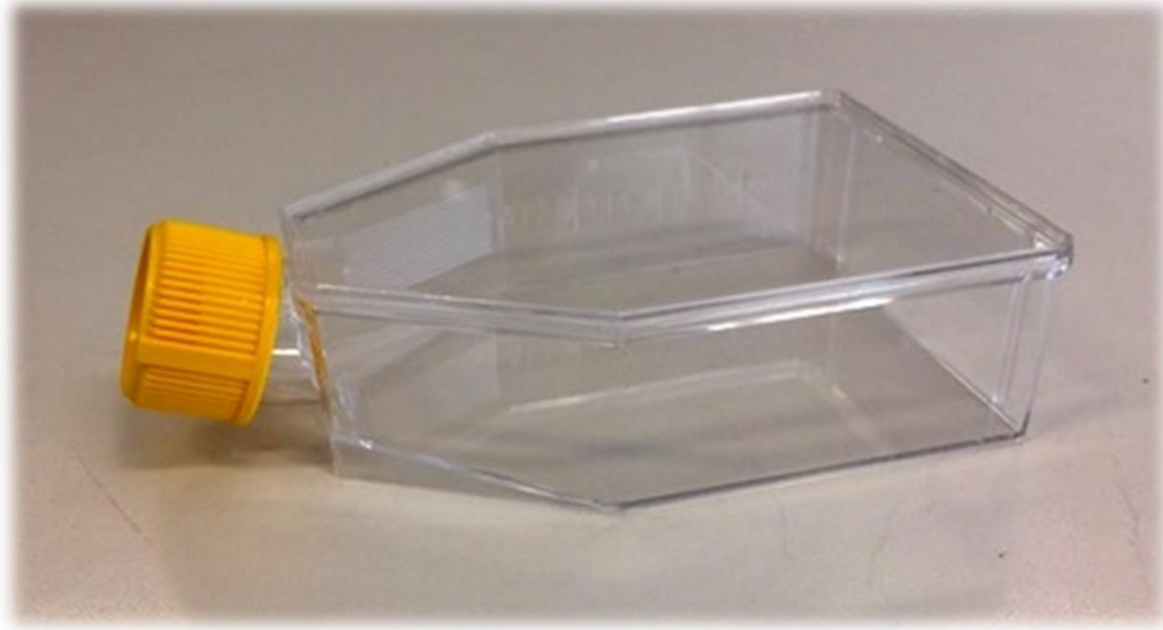
It is made of plastic material. It consists of a lower part with wells and an upper part in the form of a cap. There are 6, 12, 24 and 96-well varieties.

It is used in antimicrobial activity tests, cell culture, some other biological activity tests.



Roux bottle:

It is widely used in the production of large amounts of microorganism in the antigen or vaccine preparation stages on solid media, cell culture, tissue culture studies.



Slide:

It is a rectangular glass material used in the examination of microorganisms under microscope or in the application of some tests. Commonly used size is $\sim 25 \times 75$ mm. Thickness is ~ 1 mm.

Cover slip:

It is a very thin rectangular piece of glass that is sealed on the samples prepared on the slide for examination under the microscope. It can be in different sizes without exceeding the slide limit.



Slides Staining Jar:

It is a glass material used during painting processes, which allows the slides to be arranged side by side and without touching each other with the thin combs on the side walls. There are vertical or horizontal types.



Wash bottle:

It consists of a translucent plastic bottle and a cap system through which a thin tube passes.

It is used in washing processes during biological material preparation.



Dropper bottle:

They are usually amber colored glass bottles used for the storage of paints and reagents.

They are screw cap bottles. The covers contain a small drip tray with a rubber handle.



Inoculation loop:

It consists of a metal handle covered with a plastic handle piece and a tip made of platinum or non-oxidized wire, which is inserted into this handle with a metal screw. It is used for the cultivation of microorganisms on media.



The wire assembly can be ring-curved, straight or hooked, depending on the purpose of use.



There are also disposable plastic loops available today.

Swab:

They are wooden sticks wrapped with hydrophilic cotton at the tip, used for microbiological sampling or inoculating processes.



Burner:

It is a flame source that works with gas, used for sterilization on a small scale by flame.

It is not approached with flammable materials.

Hair, beard and eyelashes should not be bent over them to avoid burning.



Filters:

It is used in the sterilization of liquids that cannot be sterilized by heat, chemicals and rays such as vitamins or proteins by filtering with negative pressure system.

Today, membrane filters made of cellulose nitrate and cellulose acetate are mostly used. They are resistant to most solutions and reagents.

0,45 μ m pore diameter filter retain bacteria

0,22 μ m pore diameter filter retain viruses

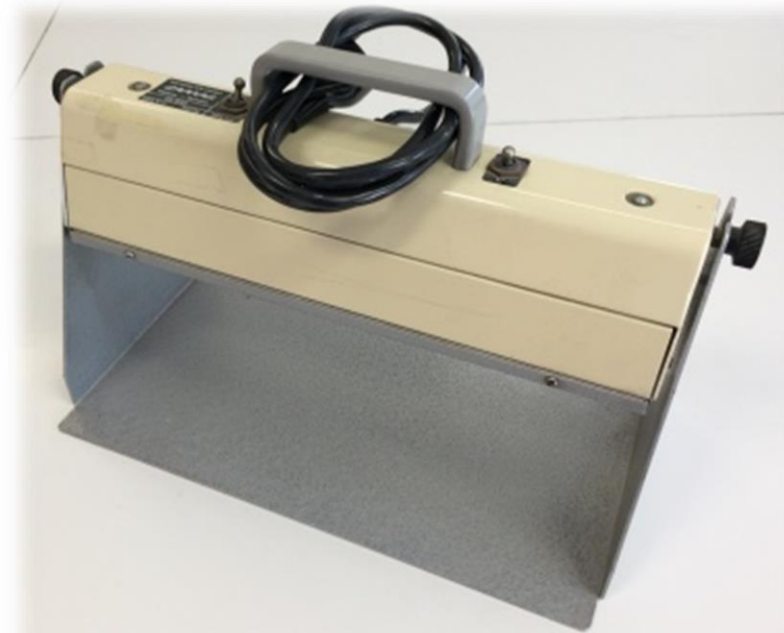


UV Lamp:

It is used for disinfection and sterilization with ultraviolet light. Suitable for sterilization of liquids, surfaces and air. There are portable, cabin, ceiling mounted types.

The range of action is the range (about 200-300 nm) absorbed by the genetic material.

265 nm is the peak of the DNA absorption curve.



Pasteur Oven:

It is a device used for the sterilization of high temperature resistant materials and equipment with dry hot air, which can be damaged under high humidity and pressure. It works on the principle that cell proteins are coagulated by oxidation.

- 170 °C' 1 hr
- 160 °C' 2 hr
- 150 °C' 2,5 hr



Autoclave:

It is a device that provides sterilization with saturated pressurized water steam. It works on the principle of denaturation of cell proteins by hydrolysis.

The vapor of the water added to the inner boiler is filled with the electrical heat until the desired pressure level is reached. There is a pressure resistant cover system. There is an adjustable pressure and temperature indicator panel on the cover. Materials placed in the tank are sterilized in this way. At the end of the process, water vapor is discharged with the valve at the bottom.

- 121 °C 15'





Anaerobic Jar:

It is a jar-like closed system in which the oxygen it contains is consumed through various reactions for anaerobic growth.



Desiccator:

It is a pot-like glass container with a lid that allows the carbon dioxide rate to be increased by burning a candle inside. It is used in the growth of microorganisms that grow in an intense carbon dioxide environment.



Spectrofotometer:

It is a device used to determine the density of the substance in a solution by measuring the intensity of light passing through it in terms of optical density.

What is measured is the amount of light absorbed by the solution.

It is used in measurements such as microorganism density, enzymatic reaction products.



Incubator:

It is a device that allows microorganisms to be growth at a fixed temperature. There are those that can be adjusted to different O₂-CO₂ levels. In addition, the necessary moisture is provided.



Water bath:

It is a device made of stainless metal, heated by air gas or electricity, with an inner chamber to be filled with shaking or static water. The temperature of the water can be adjusted to the desired degree and is controlled by reading it with a thermometer.

It is used in works requiring constant heat.



Cooler:

It ensures that biological and chemical materials are stored at a suitable low temperature ($+4^{\circ}\text{C}$ or -20°C) for a long time without losing their properties.

It ensures that most microorganism cultures are stored for a long time by minimizing their metabolic activities due to low temperatures.



Deep freezer:

Deep freezers at -80°C are used to store some chemicals with special needs or specially processed microorganisms that will be stored for a long time such as a few years.



Centrifuge:

It is a device that allows the substances in the liquid to be rotated at high speed and to be precipitated by the effect of centrifugal force by taking advantage of the density difference.

At the end of the process, the part that collapses to the bottom of the tube is called *pellet*, and the upper liquid is called *supernatant*.

Types operating at very high speeds are called ultracentrifuge and work with a cooling system.



Balance / Scale:

It is used for weighing the substances.

There are sufficiently sensitive types to very small differences in quantity or types for larger weights.



MICROSCOPE

Basically, it is a device that enables the view of structures that are too small to be seen with the eye to be magnified with the lens system.

There are different types developed for the purpose:

Electron microscope

Phase contrast microscope

Fluorescence microscope

Classical light microscope

Dark field microscope



Optical part
Mechanic part



Mechanic part:

It supports the optical system.

It consists of body, base and arms.

- **Body** holds optical parts.
- **Base** fixes the microscope to the floor and carries the illuminating parts.
- **Arm** connects the body and base parts. It also carries the stage, condenser, diaphragm and macroscrew / microscrew.

Microscope tube is the tubular part located on the upper part of the body. Connects the ocular attached to the upper end to the revolver.

Diopter enables to eliminate the difference in vision between two eyes of the person with the diopter rings.

In addition, it is possible to adjust the distance between the eyes of different individuals via the feature of opening and closing sideways on the body connection.

Stage control (carriage) is a sliding system managed by screws located at the bottom right of the stage. It provides right-left and back and forth movement on the stage. Thus, it is possible to examine different areas of the sample.

Revolving nosepiece carries the lenses. Its ability to rotate in both directions allows easy switching between lenses.

Stage located on the arm, under the lenses, above the light source. The condenser and diaphragm are hanged at the bottom of this part.

The prepared sample is placed on the stage.

The light passes through the opening in the center of the stage and first hits the sample, illuminates it from below, and then reaches the lens where the light is reflected.

There are clips or a clamping system on the stage to fix the sample.

Coarse adjustment knob (Macroscrew) is the bigger screw, used for coarse adjustment. When rotated, the table moves closer to or away from the lenses.

Fine adjustment knob (Microscrew) is the small screw, used for fine adjustment.

Optical part:

Objective lenses are the system where the first magnification takes place. It is connected to the revolver. Generally, lenses are available that provide x4, x10, x40 and x100 magnification. It provides an inverted and large view of the structure under investigation.

- x10 magnification -
- x40 magnification -
- x100 magnification -

Oculars are located at the upper end of the body part. The inverted image formed in the lens gets bigger here and -by inverting again- turns into a clear and final image. The ocular is viewed with the eyes. Oculars with x10 magnification are generally used, there are also those with x5 - x30 magnification.

The magnification power of the microscope is equal to the multiply of magnification power of the lens and the magnification power of the ocular.

Condenser is between the stage and the light source. It collects the incoming light and condenses it and transmits it.

The diaphragm is located on the condenser. It is a system that consists of parts moving by sliding on each other and that allows the amount of light to be adjusted by the contraction and expansion of this segmented system.

Illuminator is a lamp assembly built into the stand.

Non-stained sample examination

Protozoa and cysts', helminth eggs, molds, and some eukaryotic unicellular can be examined without staining during rapid examinations. In addition, motion examination is also examined as well.

The condenser of the microscope should be in the down position and the diaphragm in semi-open position.

The examination starts with an x10 lens. When necessary, x40 lenses are used.

Stained sample examination

Bacteria, yeasts, some eukaryotic unicellular and certain structures of these creatures are examined by staining.

The condenser of the microscope must be in the up position and the diaphragm must be fully open.

The examination is made with an x100 lens.



When using X100 magnification, 1 drop of immersion oil is dropped on the sample. Because:

Due to the refractive index of the air between the sample and the lens, the light that passes through the slide will be refracted sideways again before entering the lens and the image will be scattered.

Since the refractive index of the oil is close to that of the glass, when we fill the gap with it, there will be no refraction and a clear image will be provided.

Cleaning Microscope:

The analyzed sample is removed. It is put into the storage bin or thrown into the waste bin.

The lenses and stage used are gently wiped with gauze-like muslin moistened with 70% alcohol. Make sure that there is no oil residue on the x100 lens.

Revolver is left in x4 lens.

The plug of the microscope is wrapped loosely on the base.

The microscope cover is covered.

Decontamination:

It is the whole process of returning the materials or surfaces used to their pre-use state by purifying them from contaminants.

Sterilization:

It is the process of cleansing or inactivating an object or an environment from all living forms, including spore forms, of microorganisms in / on it.

The materials sterilized for use are packaged / covered in appropriate forms to avoid contamination after the process, and stored in this way.

After sterilization, there is no structure in the environment that is capable of growing or reproduction.

Disinfection: It is the process of purifying an object or its environment from microorganisms at a level that prevents it from becoming a source of infection.

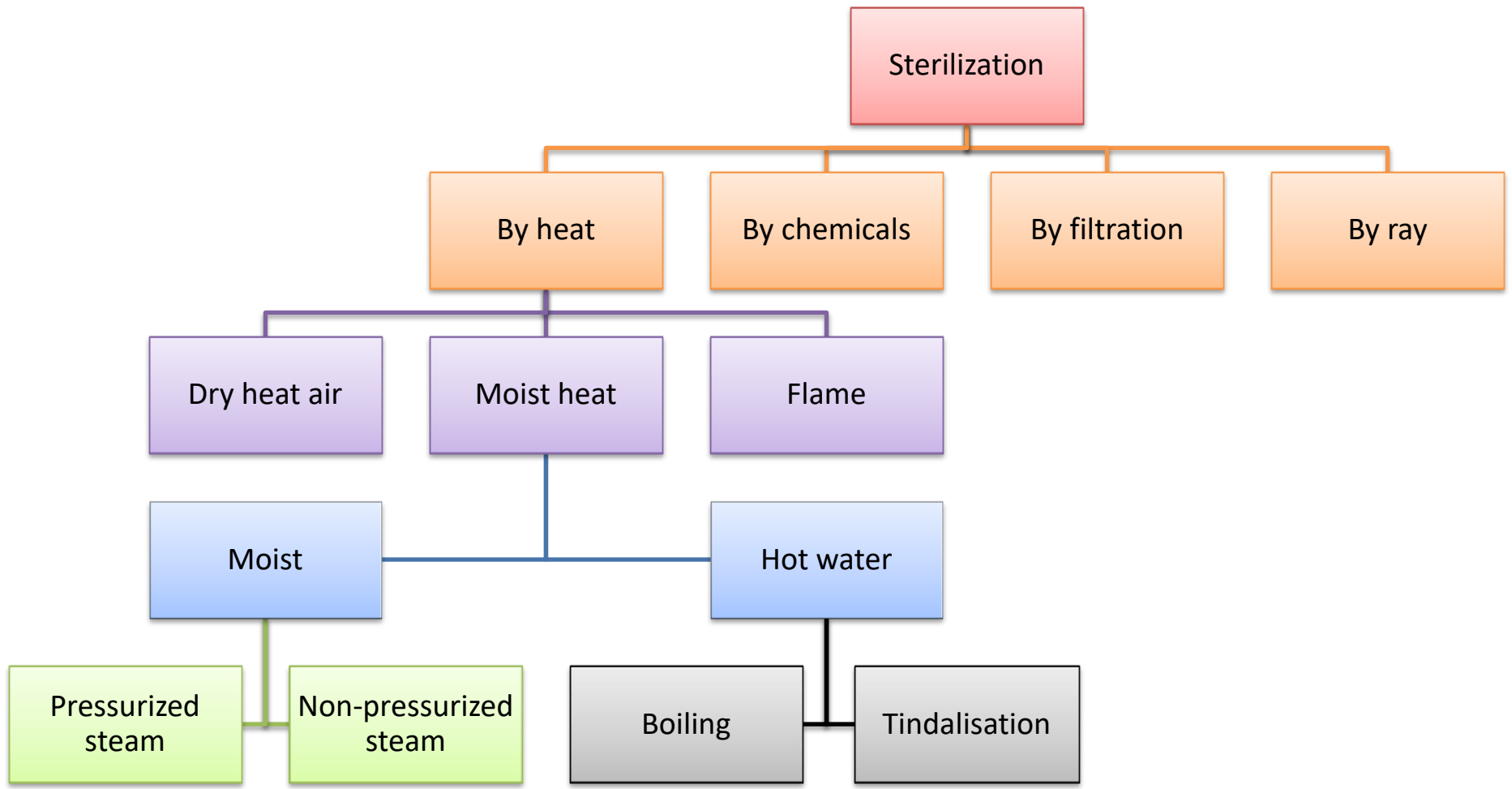
Disinfectant: Chemical substances used for disinfection.

Antisepsis: It is the destruction of pathogenic microorganisms on the body surface or lesions with chemical substances.

Antiseptic: Chemical substances used in antisepsis process.

Microbicides: Substances that cause the death of microorganisms.

Microbiostatic: Substances that stop the growth / development of microorganisms.



Applications

Videos will be shared on the system during the course.

References

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