General Microbiology Lab

Lab 2
Principles and uses of Microbiological Instruments

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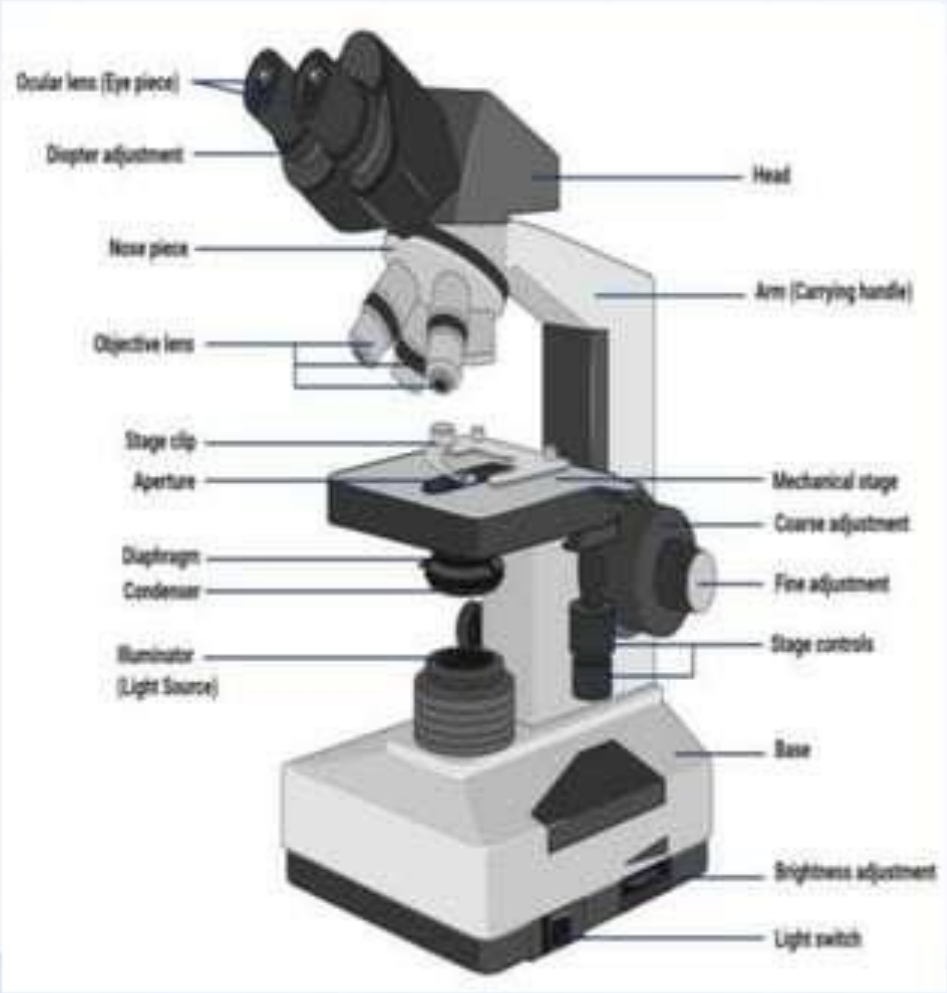
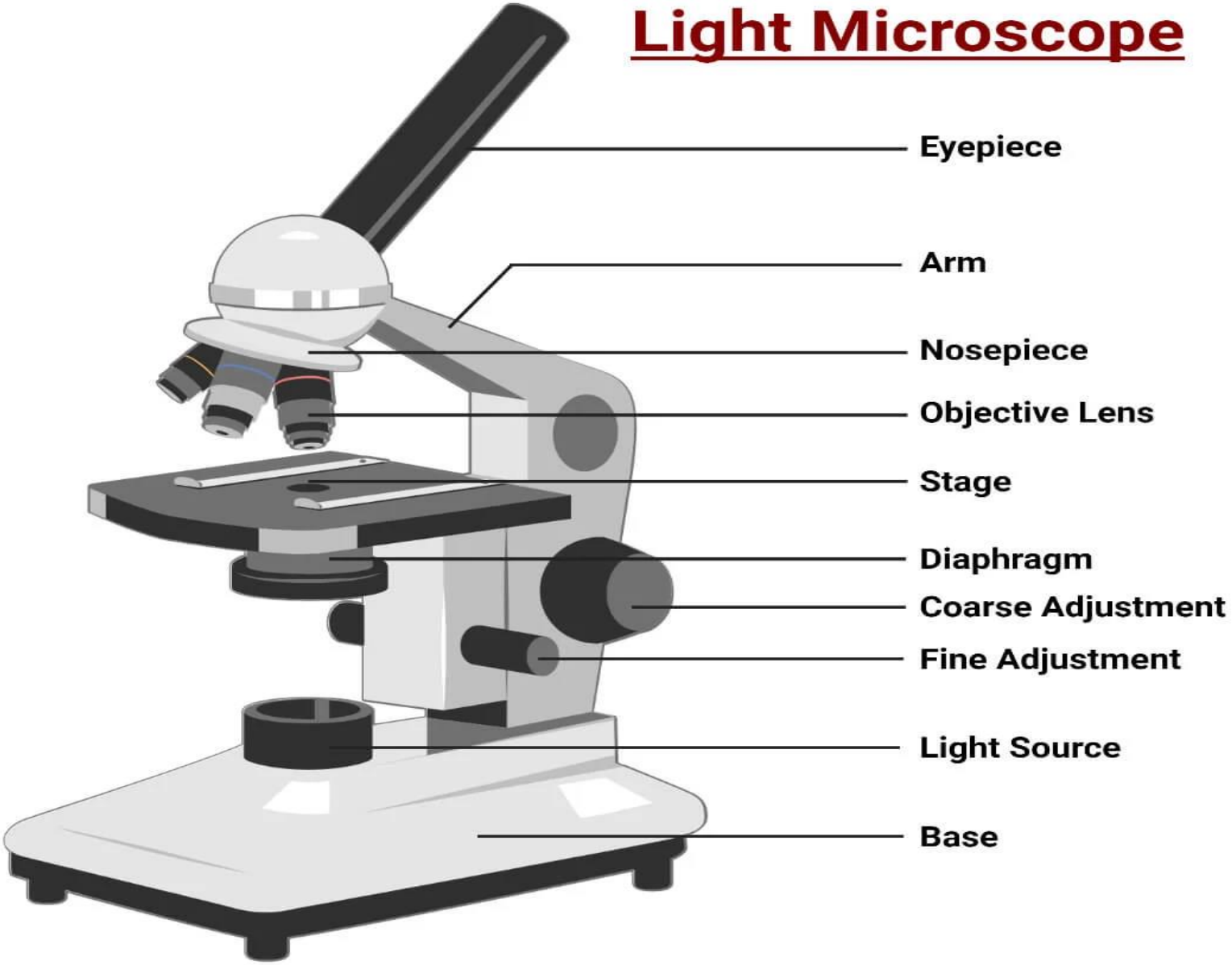
1. MICROSCOPE

- The microscope is a device that magnifies objects (or) organisms that are too small to see with the naked eye.

- **Parts:** Eye lens, Objective lens, Condenser, Beam of light, Specimen stage, Aperture diaphragm.



Light Microscope



Principle:

- ✓ Light is produced from either an internal (or) external light source and passes through the iris diaphragm.
- ✓ The light then passes through the condenser which focuses the light onto the specimen.
- ✓ The objective lens magnifies the image of the specimen before the light travels through the barrel of the microscope.
- ✓ Finally light is passes through the eyepieces lens & into the viewer's eye which sends impulses to the brain which in turn interprets the image.

Uses:

- ❖ In biological field, microscopes are used to study bacteria, cells and many more.
- ❖ This device helps biologists in their study of living organisms and their cell structures.
- ❖ used for visual observation of morphology, motility, staining and fluorescent reactions of bacteria.

2. Analytical balance

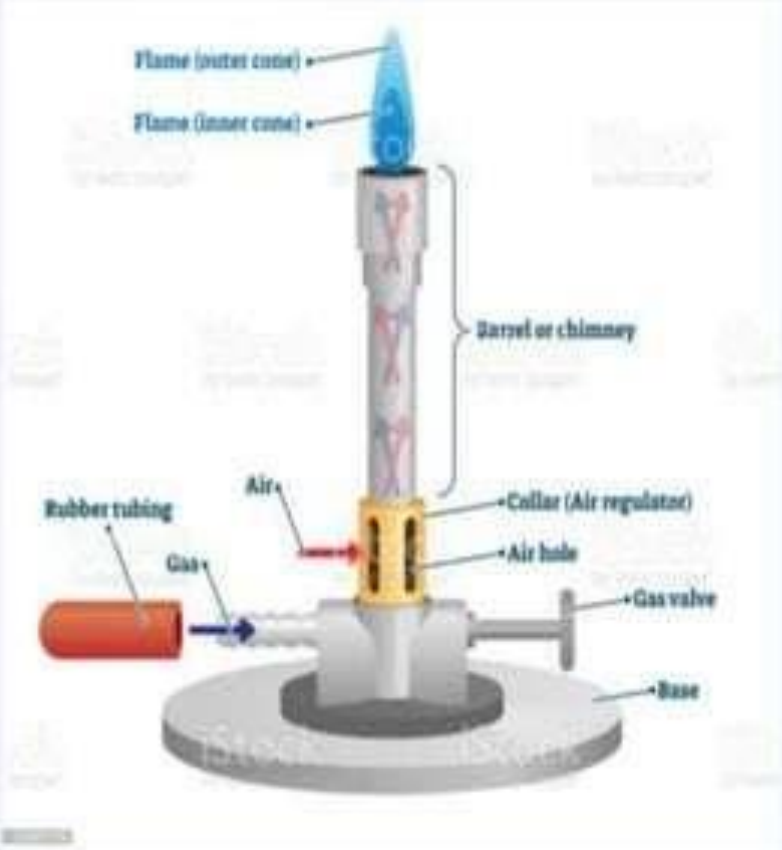
- Sensitive Instruments.
- Used to quantify mass precisely, usually to the nearest 0.1 mg or more.
- To keep dust, air currents, and other outside elements from interfering with it.
- Electromagnetic Force Restoration (EMFR) Principle: involves counteracting the weight of the object with an electromagnetic force.

3. Deep freezers

- That are used to preserve and store food products, medical equipment, blood samples, medicines and injections, etc. for a long period of time.
- There are numerous types of deep freezers such as blood bank refrigerators, freezer drier, ultra-low deep freezer.
- the temperature range inside these chambers can be set from -10 to -60 degree Celsius.

4. BUNSEN BURNER

- Bunsen burner is a standard tool used in laboratories, named after Robert Bunsen.
- It is a gas-fueled single open flame.



Principle:

- ✓ This burner is made with a metal tube on a flat base with a gas inlet at the bottom of the tube, which may have an adjustable valve. On the sides of the tube are openings which can be adjusted with a collar to control the amount of air that can enter.

- ✓ Once the burner is connected to a gas source, the gas is forced by the gas pressure so that the gas reaches the top where the flame is ignited with a match or a lighter.

Uses:

1. It is commonly used for processes like sterilization, combustion, and heating. In medical or microbiology laboratories, it is commonly used for micro-loop sterilization.

5. LAMINAR AIR FLOW

- Laminar Hood is a closed device primarily for processes or instruments sensitive to microbial contamination.

6. WATER BATH

- Water Bath is a conventional device that is used for chemical reactions that required a controlled environment at a constant temperature.

7. WATER DISTILLER

- A water distiller is a device that purifies water by the process of distillation.

- This instrument is commonly used in medical laboratories, microbiology laboratories, organic chemistry laboratories and medical industries.

8. VORTEX MIXTURE/VORTEXER

- A vortex mixture is one of the basic technologies used for the mixing of samples in glass tubes or flasks in laboratories.

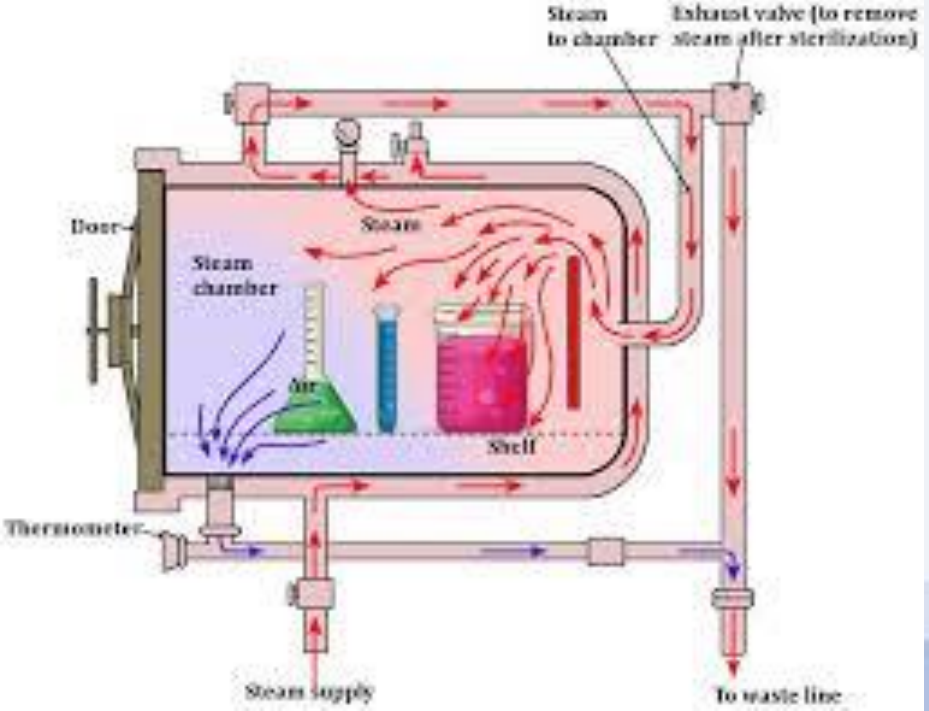
9. INCUBATOR

- An incubator is a device that is used in the laboratories for the growth and maintenance of microorganisms and cultures.

- Incubator provides an optimal temperature, pressure, moisture, among other things required for the growth of microorganisms.

10. AUTOCLAVE

- An autoclave is a pressurized chamber used for the process of sterilization and disinfection by combining three factors: time, pressure and steam



Principle:

- ✓ Autoclaves use steam as their sterilization agent. The basic principle of an autoclave is that all the items within the autoclave come in direct contact with the steam for a particular period irrespective of the nature of the material- whether it is liquid, plastic ware, or glassware.

- ✓ The amount of time and the temperature depends on the type of material being sterilized and the increase in temperature of the cycle allows for shorter periods.

Uses:

1. Autoclaves are mostly used for the sterilization of medical or laboratory equipment with the capacity of sterilizing a large number of materials at once.

2. They are commonly used for the preparation of culture media during laboratory applications.

11. HEATING PLATE

- A hot plate is a stand-alone appliance used in microbiology laboratories as a tabletop heating system.

Principle:

- ✓ Unlike the traditional ways of producing heat through the fire, a hot plate produces heat by the flow of electricity.

- ✓ On a hot plate, electricity runs through the coils which have a high level of electrical resistance. The resistance in the coils converts the electrical energy into heat energy which causes the coils to release heat.

Uses:

1. In a laboratory, hot plates are used to heat glassware and their components.

2. They are used over water baths as in water baths might be hazardous in case of any spills or overheat.

12. CENTRIFUGE

- Centrifuge is a instruments which is used to separate the sample by using centrifugal force.

13. COLONY COUNTER

- A colony counter is used to estimate the density of a liquid culture by counting the number of CFU (colony forming units) on an agar or culture plates.

14. pH METER

- pH meter is a device used in laboratories that measure the H-ion concentration in water-based solutions to determine the acidity / alkalinity of the solution.

- A pH meter is often termed as "potentiometric pH meter" as it measures the difference in electric potential between the reference and a pH electrode.

15. SPECTROPHOTOMETER

- The spectrophotometer is an optical instrument for measuring the intensity of light in relation to the wavelength.

- Based on the amount of light absorbed by a colored solution, a quantitative analysis of the solution can be done.

16. MAGNETIC STIRRER

- Magnetic Stirrer is a device commonly used in microbiology laboratories for the purpose of mixing liquids.

17. HOT AIR OVEN

- A hot air oven is an electrical device that is used for sterilization of medical equipment or samples using dry heat.

- Hot air oven is a type of dry heat sterilization which is performed on dry materials and on substances that do not melt or catch fire under high temperature.

18. HOMOGENIZER

- Homogenizer is a device used in laboratories for the mixing of various liquids and materials like tissue, plant, food, soil, and many others.

19. MICROPIPETTE

- Micropipettes are utilized in the laboratory to transfer small quantities of liquid, usually down to 0.1µl.
- Micropipettes are used by attaching a disposable polypropylene tip to reduce the possibility of contamination.

20. HEATING MANTLE

- A heating mantle is a device. which is used in laboratories to heat certain media in glass vessels.
- Heating mantle is a good alternative to heating baths.
- Due to the various sizes of the glass vessels, the exact amounts of liquids which are necessary can be heated.

21. SHAKING INCUBATOR

- An **incubator** is a device used to grow and maintain **microbiological** cultures or cell cultures.

- The **incubator** maintains optimal temperature, humidity and other conditions such as the CO_2 and oxygen content of the atmosphere inside.

22. BOD INCUBATOR

- Biochemical oxygen demand is the amount of dissolved oxygen needed (i.e. demanded) by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period.

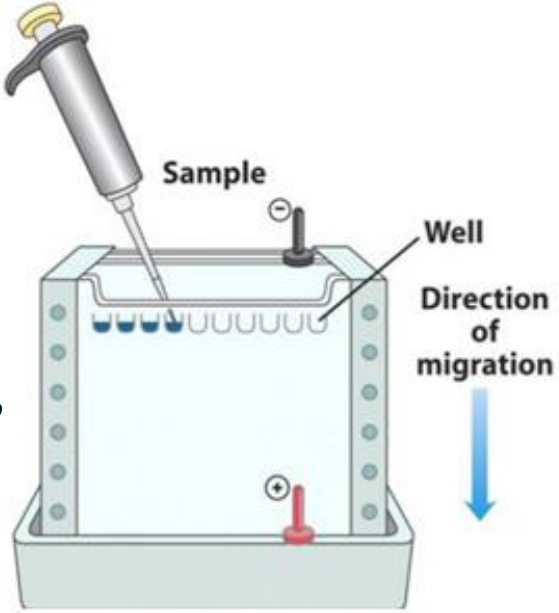
23. GEL ELECTROPHORESIS

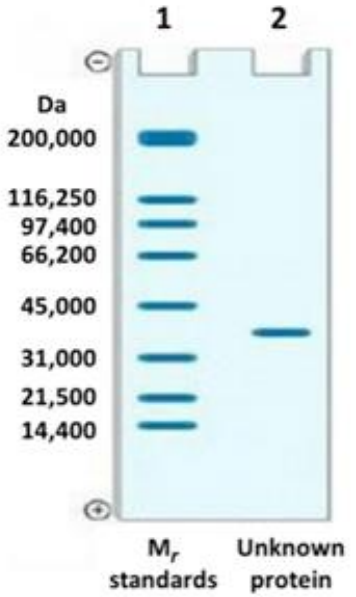
- Gel electrophoresis is a laboratory method used to separate mixtures of DNA, RNA, or proteins according to molecular size.

- In gel electrophoresis, the molecules to be separated are pushed by an electrical field through a gel that contains small pores.

24. SDS-PAGE

- **Polyacrylamide gel electrophoresis** (PAGE) is a common technique used in biochemistry, molecular biology, genetics, and biotechnology to separate biological macromolecules including DNA, RNA, and proteins.
- Generally, it is the process of applying an electric field to move charged molecules through a solution in all forms of electrophoresis.
- In this technique, the mobility of a charged molecule is determined by its net charge, length and conformation.





25. MORTAR AND PESTLE

- Mortar and pestle are implements used since ancient times to prepare ingredients or substances by crushing and grinding them into a fine paste or powder in the laboratory, and pharmacy.

26. PETRIDISH ROTATOR

- It is a laboratory device which is used for spread the sample evenly.
- Mostly used in spread plate technique.