SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr M.G.R Medical University, Chennai

DEPARTMENT OF OPERATION THEARE AND ANAESTHESIA

TECHNOLOGY

COURSE NAME: MICROBIOLOGY

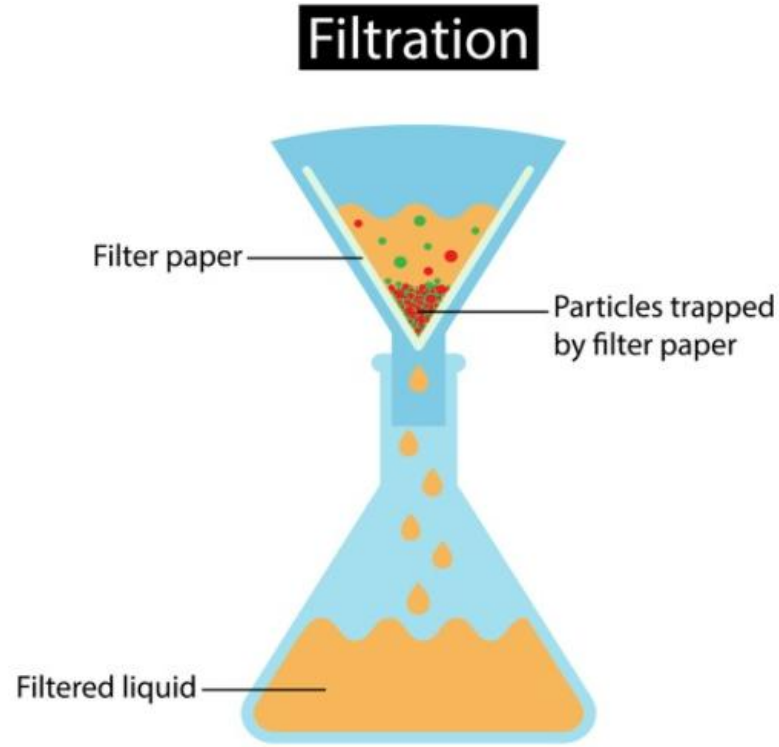
UNIT : 1

TOPIC : STERILIZATION – PHYSICAL METHOD – FILTRATION

FACULTY NAME: MITHRA V

FILTRATION (DEFINE)

- Preferred method for sterilizing heat-sensitive liquids and gases without denaturing heat.
- **Applications**:
  - Sterilizes antibiotics, toxic chemicals, radioisotopes, vaccines, carbohydrates.
  - Used for heat-sensitive injections, ophthalmic solutions, biological products, and air in aseptic areas.



FILTER SELECTION CRITERIA

Mechanism: Removes contaminating microorganisms rather than destroying them.

Common Filter: Nitrocellulose filter with 0.22µm pore size.

Size Ranges:

Bacteria: 0.5–5.0 µm

Viruses: 0.1–0.36 µm

Implication: 0.22µm filters retain bacteria and spores but not all viruses.

TYPES OF FILTERS

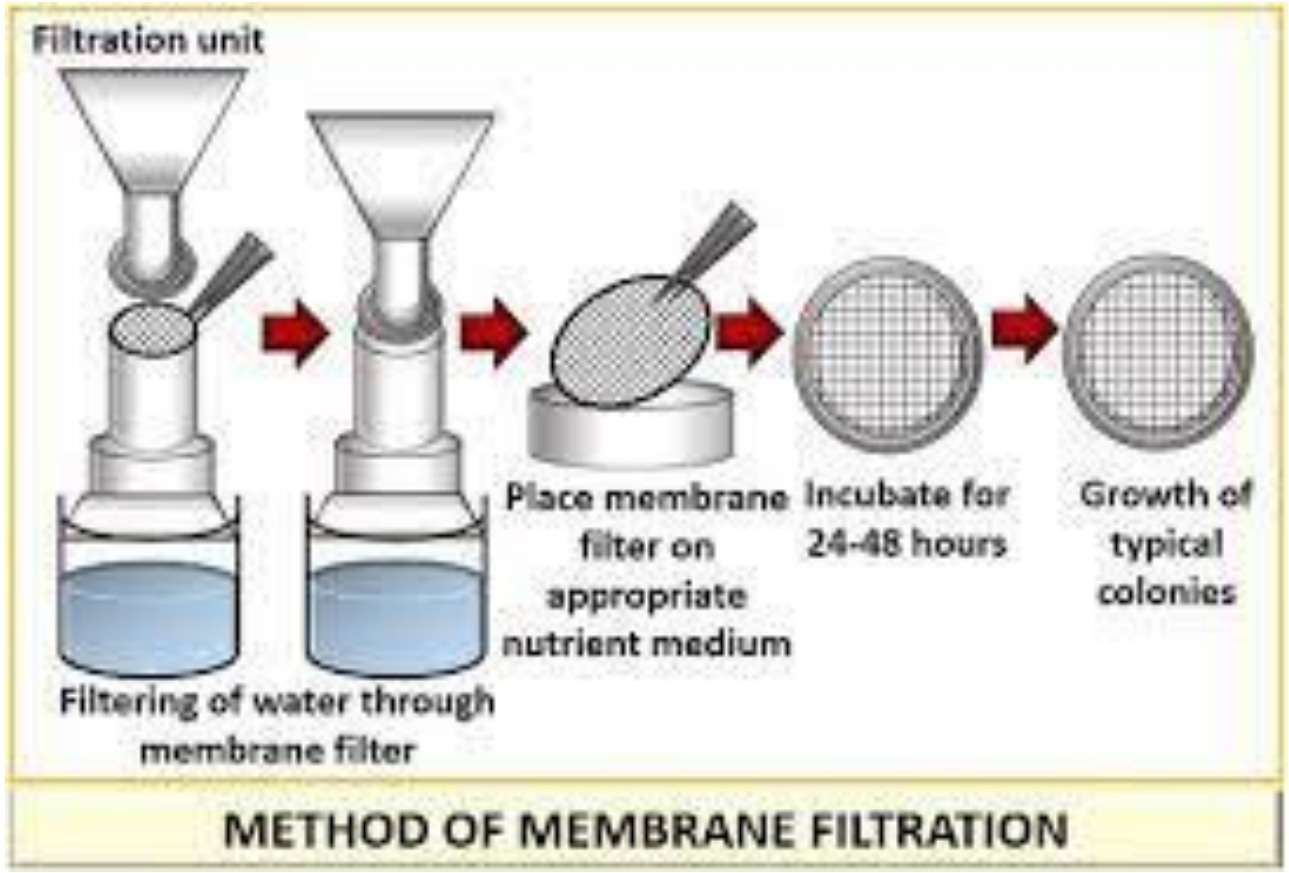
Materials	Name of the filter
Asbestos pad	Seitz filter
Diatomaceous earth	Berkefeld filter
Procelain	Chamberland-Pasteur filter
Sintered glass disks	Sintered glass filter
Cellulose	Membrane filter
Borosilicate glass fiber	HEPA filter
Clay, mud	Candle filter

INDUSTRIAL APPLICATIONS OF FILTERS

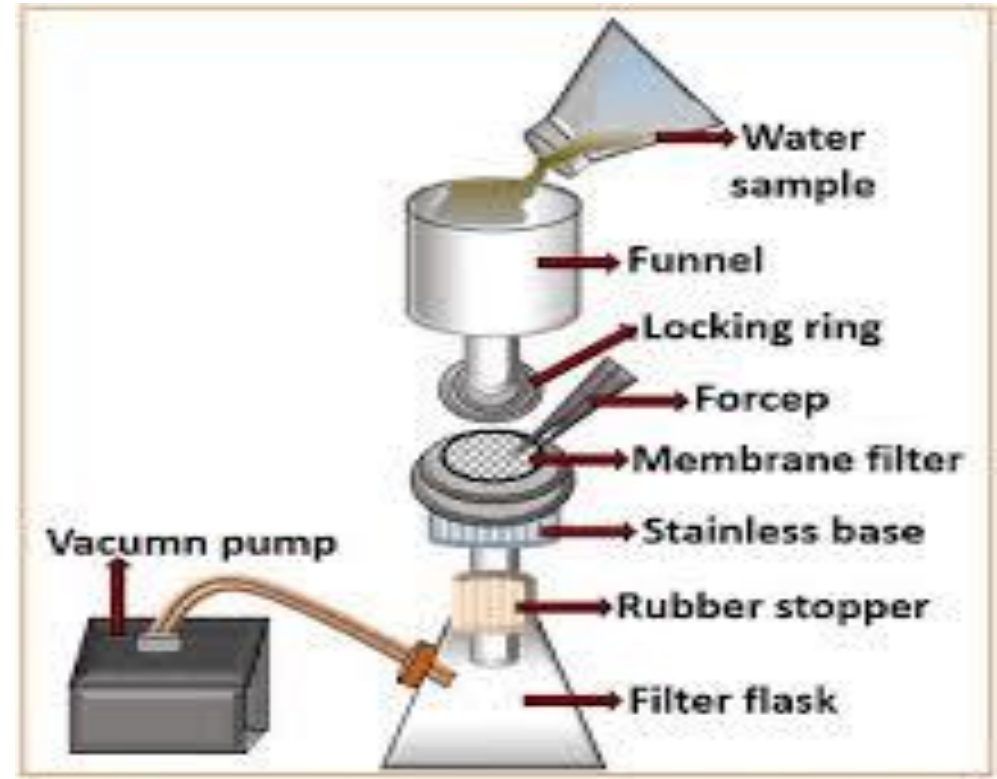
- **Uses in Industry**:
  - Venting systems in:
    - Fermenters
    - Centrifuges
    - Autoclaves
    - Freeze-driers

MEMBRANE FILTERS

  - Circular membranes (~150µm thick) made of cellulose acetate, nitrate, or polysulfone.
  - Contain millions of microscopic pores (0.1–10µm, commonly 0.22µm or 0.45µm).
- **Formats**: Discs for syringe-mounted, or vacuum filtration devices.
- **Uses**:
  - Sterilization of ophthalmic solutions, antibiotics.



METHOD OF MEMBRANE FILTRATION



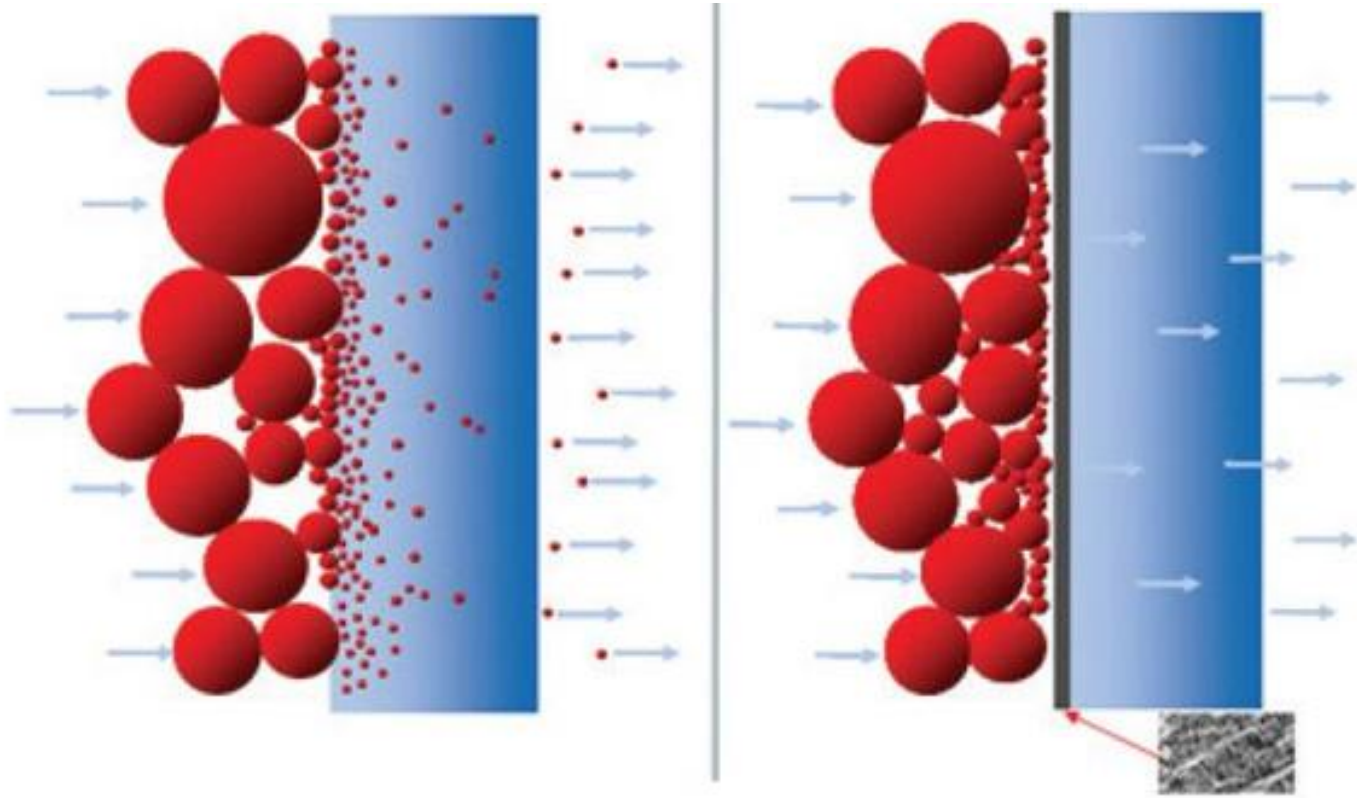
MEMBRANE FILTRATION UNIT

DEPTH FILTERS

- Fibrous sheets/mats of overlapping paper or borosilicate glass fibers.
- **Mechanism**: Traps particles within fiber network
- **Examples**: Fibrous pads, sintered glass, ceramic products.
- **Uses**:
  - Air sterilization in industrial processes.
  - Traps dust, spores, allergens).
  - Biological safety cabinets (HEPA filters).

DEPTH VS MEMBRANE

Depth Filtration
Particles penetrate the structure of the media and form a filter cake on the surface

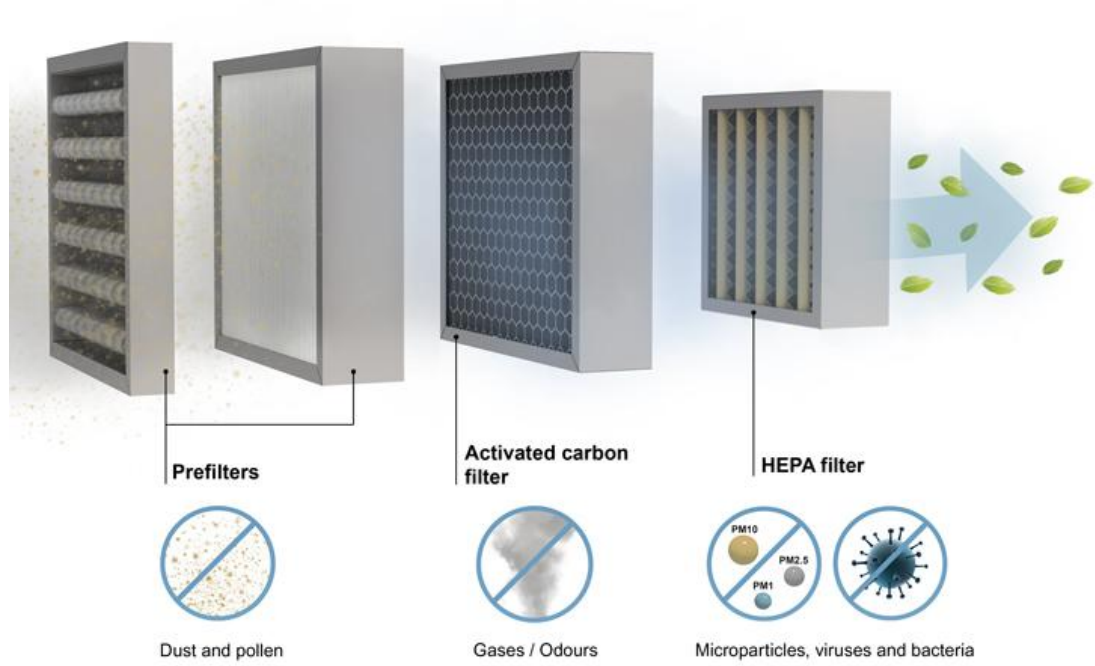


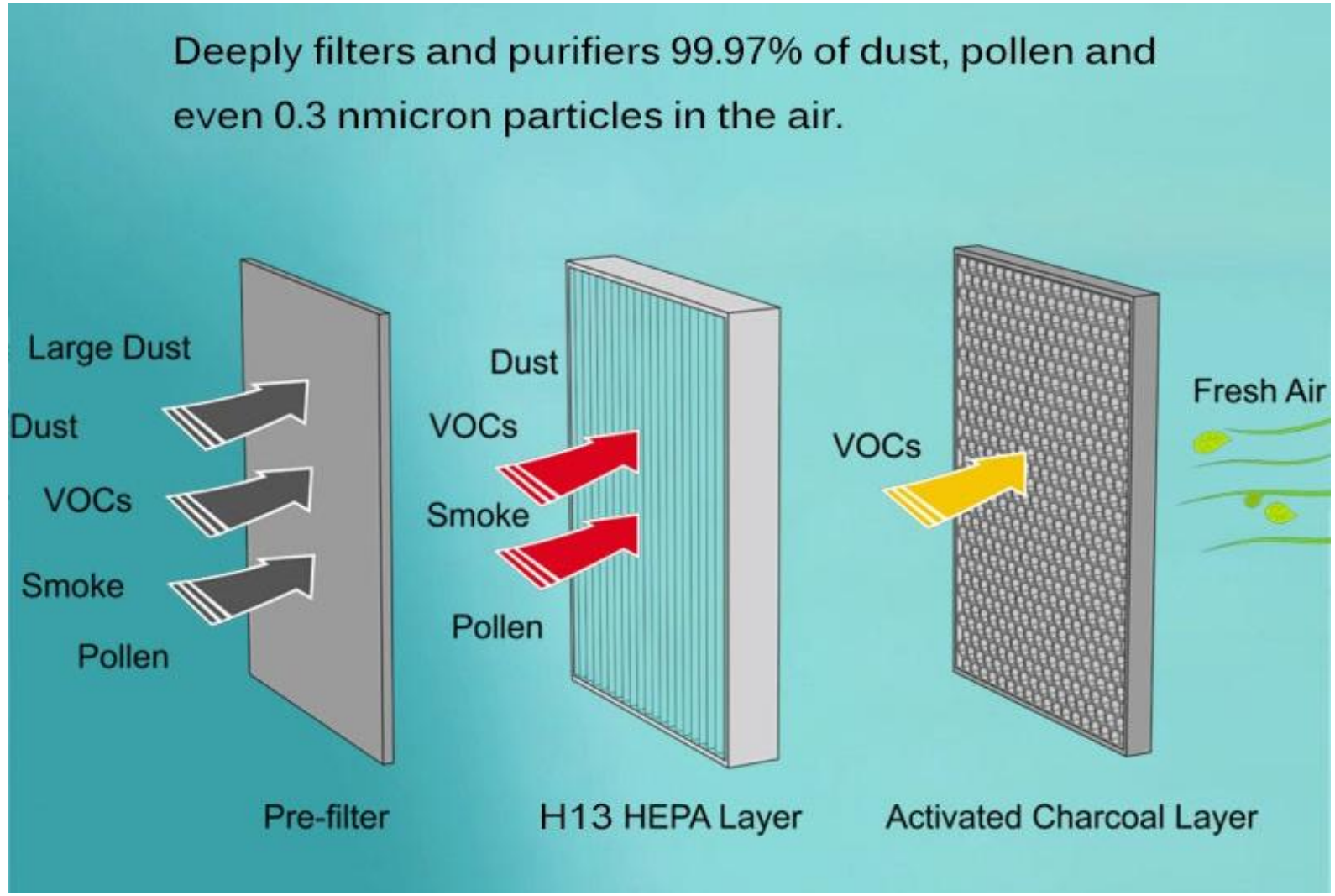
Surface Filtration
Particles are collected on the surface of the membrane

HEPA FILTERS

- Borosilicate glass fiber sheets with water-repellent binder
- Remove 99.97% of particles ≥0.3µm, including most microorganisms.

- **Applications**:
  - Laminar flow biological safety cabinets.
  - Operating theaters and burn patient rooms.
  - Clean rooms and isolation units.




Deeply filters and purifiers 99.97% of dust, pollen and even 0.3 nmicron particles in the air.
Large Dust
Dust
VOCs
Smoke
Pollen
Pre-filter
Dust
VOCs
Smoke
Pollen
H13 HEPA Layer
VOCs
Fresh Air
Activated Charcoal Layer

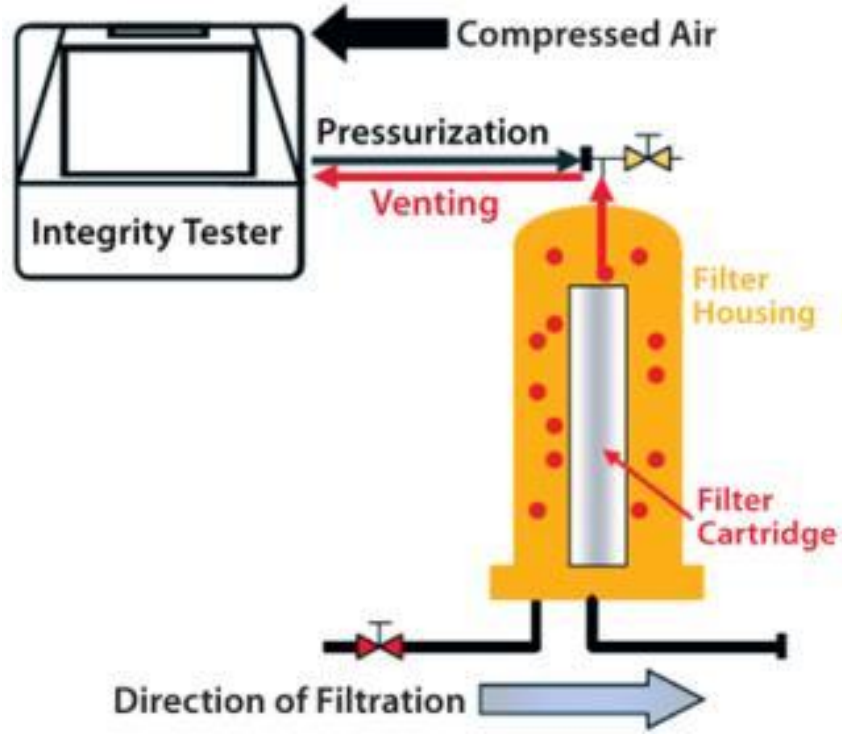
ADVANTAGES AND LIMITATIONS

- **Advantages**:
  - Less capital-intensive than other sterilization methods.
  - Suitable for heat-sensitive liquids (infusions, vaccines, hormones).
  - Filters large liquid volumes quickly.
- **Limitations**:
  - Only for liquids and gases.
  - Filters (especially nano-filters) are expensive to replace.
  - Clogging may occur.

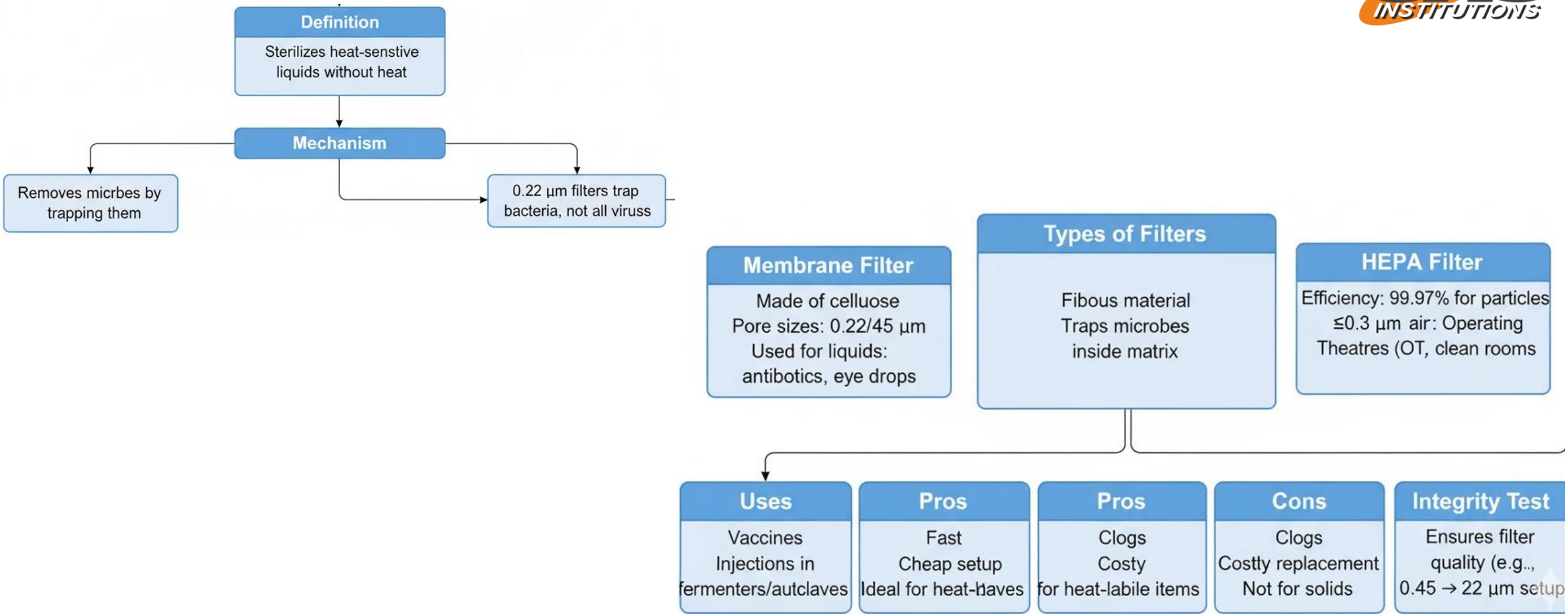
FILTER INTEGRITY TESTING

- Tests to verify filter membrane quality per regulatory requirements.
- **Purpose**: Ensure contamination-free products.
- **Process**:
  - Tests membrane, disk filters, capsules/cartridges.
  - Uses filter integrity machines.
  - Common setup: 0.45µm filter followed by 0.22µm filter.

FILTER INTEGRITY TESTING



FILTRATION - SUMMARY



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- U.S. Food and Drug Administration (FDA). (2004). *Guidance for Industry: Sterile Drug Products Produced by Aseptic Processing — Current Good Manufacturing Practice*.

THANK YOU